OUTBOARD POCKET SERVICE GUIDE



MERCURY OUTBOARDS

MERC MODELS

40 (2-Cyl.)-45-75-110-200-402-500-650-700-800-850-900-1150-1400-1500 and V-6's

C-90-76[illegible]

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MERCURY MARINE
DIVISION OF BRUNSWICK CORPORATION
FOND DU LAC, WISCONSIN 54935

Printed in U.S.A.

LUBRICATION and MAINTENANCE CHART

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	§	D		

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Tiller Handle Knuckle Pivot/Gears, Lubricate	§	D		
Tilt Stop Lever, Lubricate	§	D		
Upper Shift Shaft, Lubricate	§	D		

NOTE: Complete list of maintenance is not applicable to all models.
§ - Units operated in salt water.
** - Includes all pivot points and sliding surfaces, unless stated elsewhere.*
A - Super-Duty Quicksilver Gear Lubricant
B - Perfect Seal
C - Anti-Corrosion Grease
D - Multipurpose Quicksilver Lubricant
E - SAE 5W-30 or SAE 5W-20 Specification "SE" Automotive Oil
L - Quicksilver Marine Cleaner
M - Quicksilver Spray Paint

QUICKSILVER LUBRICANTS

(From Your Mercury Dealer) Description	Part No.
Anti-Corrosion Grease	C-92-63290
Corrosion and Rust Preventive	C-92-63260
Engine Cleaner	C-92-63214
Formula 50 2-Cycle Motor Oil	C-92-65183 C-92-65186
Formula 50-D 2-Cycle Motor Oil	C-92-65193 C-92-66229
Multipurpose Lubricant	C-92-63250
Perfect Seal	C-92-34227
Storage Seal	C-92-63233
Super-Duty Gear Lubricant	C-92-68617 C-92-68623

OUTBOARD TUNEUP

Description

1. An engine tuneup is a service to put the maximum capability of economy, power and performance back into the engine and, at the same time, assure the operator of a complete check and more lasting results in efficiency and trouble-free operation.
2. Each year tuneup of the modern outboard engine has become increasingly important with improved power and performance. Today, this increase in power and performance has meant higher compression ratios and new and improved electrical systems among other advances in design.
3. It is advisable that the service technician follow a definite and thorough procedure of analysis and correction of all items which affect power, performance and economy to assure lasting results.
4. The extent of engine tuneup usually is determined by the amount of time since the last servicing of the engine; however, specific servicing of items on the engine should be performed at regular intervals, depending upon conditions under which the engine operates.
5. Check for satisfactory water pump operation prior to tuneup (or repairs).

Tuneup Sequence

1. Compression Check
2. Spark Plug Inspection and Adjustment
3. Lower Unit and Water Pump
4. Carburetors
5. Fuel System
6. Ignition System
7. Starter Motor and Solenoid
8. Alternator and Rectifier
9. Internal Wiring Harness
10. Adjustments Prior to Testing
11. Boat Test
12. Additional Checks and Adjustment

TUNEUP SERVICE SEQUENCE

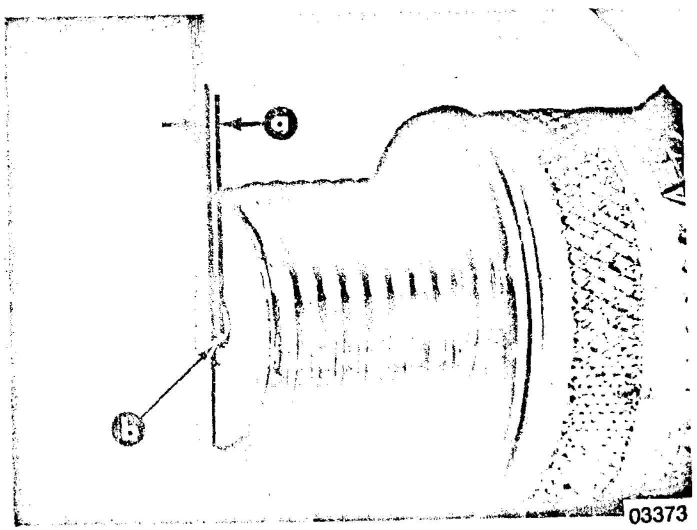
1. Complete tuneup should follow checks and adjustments shown in "Tuneup Sequence" immediately preceding.
2. Changes to sequence of service outlined should be minimized whenever possible.
3. Tuneup is performed in 2 parts:
   a. Maintenance and adjustments
   b. Additional checks and adjustments
      (1) Includes added instrument checkouts performed with any of the modern compact units of service equipment available for this purpose.
      (2) Many checks and adjustments are included to isolate and correct trouble located during tuneup.
      (3) Always follow instructions for use of equipment as provided by manufacturer.
4. When conditions are uncovered which require major corrective action, refer to Service Manual for detailed service information.
5. The following item numbers correspond with item numbers in "Tuneup Sequence" preceding.

1. Compression Check

1. Remove spark plug wires and all spark plugs and check condition.
2. Disconnect or install a ground wire, as instructed on wiring diagram (see "Wiring Diagram" by model, following). to render ignition system inoperative while performing compression check.
3. Install compression gauge in spark plug hole.
4. Crank engine thru at least 4 compression strokes at wide-open throttle (WOT) to obtain highest possible reading.
5. Check and record compression of each cylinder. Variation of more than 15 lbs. per sq. in. (1.050kg/cm²) between cylinders indicates that lower compression cylinders are in some way defective, such as worn or sticking piston rings and/or scored pistons and cylinders.
6. Compression check is important because an engine with low or uneven compression cannot be tuned successfully to give peak performance. It is essential, therefore, that improper compression be corrected before proceeding with an engine tuneup.
7. If powerhead shows any indications of overheating, such as discolored or scorched paint, inspect cylinders visually thru transfer ports for possible scoring. It is possible for a cylinder to be scored slightly and still have comparatively good compression.
8. Check water pump. A failure may be cause of overheating.

2. Spark Plugs Inspection and Adjustment

1. Inspect each spark plug for make and heat range. All plugs must be of the same make and number or heat range.
2. Remove spark plugs, clean and inspect. If center electrode is eroded (Figure 1), replace with new spark plug listed in "Timing/Synchronizing/ Adjusting" section, following.



a - 1/32" (0.8mm) b - Center Electrode

Figure 1. Thunderbolt Plug

3. Inspect spark plug hole threads and clean before installing plugs.

> **CAUTION: Crank engine several times to blow out any material which might become dislodged during cleaning operation.**

4. Install spark plugs in engine with new gaskets and tighten to 17 ft. lbs. (2.35mkg) torque. Improper installation is one of the greatest single causes of unsatisfactory spark plug performance.
5. Always use a new gasket and wipe seats in head clean. Gasket must be fully compressed on clean seats to complete heat transfer and provide a gas tight seal in the cylinder. For this reason, as well as the necessity of maintaining correct plug gap, the use of correct torque is extremely important during installation.

3. Water Pump Installation

REMOVE WATER PUMP

1. Set gear housing in vise in upright position with skeg held between blocks of wood.
2. Remove centrifugal slinger from drive shaft.
3. Remove water pump body assembly.
4. Remove water pump and remove impeller and impeller drive pin and face plate.
5. Check impeller face plate and water pump insert closely for wear or damage.
6. Remove water pump base assembly and water inlet tube (if equipped).
7. Remove "O" ring and oil seal from base plate assembly and watch for shims under base assembly.

SHIMMING of WATER PUMP BASE

Lower units, with a ball bearing on the drive shaft, must be shimmed to "Zero" clearance between drive shaft ball bearing and water pump base, as follows:

1. Position a new gasket to lower unit over water pump studs.
2. Install original shims, plus .020" (.51mm) additional shims, above drive shaft bearing. This will result in an "over-shim condition".
3. Lubricate seals in water pump base. Remove "O" ring from water pump base to ease installation for measurement only.
4. Position water pump base into lower unit; push down firmly.
5. Measure gap between water pump base gasket and water pump base with a feeler gauge.
6. The gap measured, plus .002" (.051mm), is the correct amount of shims to remove. This will result in "Zero" gap between water pump base and drive shaft bearing, which is correct and will result in .002" compression of the gasket.

   EXAMPLE: If gap measured is .010" (.25mm), remove .012" (.30mm) shim. If gap measured is .005" (.13mm), remove .007" (.18mm) shim.

7. Merc 110-75-45 models do not use a gasket. If gap measured is .005", remove .005" shim to give "Zero" gap.
8. Install "O" ring on water pump base and install base to lower unit.

   NOTE: Lower units with tappered drive shaft bearings do not require shimming of water pump base.

INSTALLING WATER PUMP

1. Install water pump base to face plate gasket, stainless steel face plate and face plate to water pump cover gasket.

2. Coat drive pin area of drive shaft with Multipurpose Lubricant (C-92-63250).
3. Position drive pin on drive shaft and install impeller. Check that drive pin does not slide out of flat area, as this will cause the impeller to be forced against the insert after assembly and result in premature impeller wear.
4. Coat insert area of water pump cover with Perfect Seal (C-92-34227) and install insert. Be sure that tab on insert enters location hole in water pump cover. Clean off any excess Perfect Seal that was displaced while installing insert.
5. Lubricate insert with Multipurpose Lubricant.
6. Slide water pump cover over drive shaft and down onto impeller while turning the drive shaft in a clockwise direction (viewed from top of drive shaft). Be sure that impeller drive pin is in position and impeller turns with drive shaft.
7. Install washers, lockwashers, nuts and bolt (as required) and torque to specifications, as follows:

1/4" bolts 20 in. lbs. (23kg-cm) *5/16" studs 40 in. lbs. (46kg-cm)*
1/4" studs 30 in. lbs. (35kg-cm)

8. Install water guide tube and drive shaft slinger.

4. Carburetors

CARBURETOR ADJUSTMENT

1. Jet size recommendations are intended as a guide (like a propeller chart). Try a size larger or smaller if in doubt. See jet sizes in chart, following.
2. No change in spark advance is recommended for elevation operation. Propellers of lower pitch should be used at high elevations to allow proper engine RPM.

HIGH SPEED ADJUSTMENT

High speed has a fixed jet, similar to those used in automobiles.

IDLE ADJUSTMENT (Integral Fuel Pump Type Carburetor Only)

1. Idle mixture and idle speed have been set at the factory. Due to local conditions, it may be necessary to readjust the carburetor (in the test tank or on the boat).
2. Set idle mixture screw specified turns open from a lightly seated position. (See specified setting in following "Timing/Synchronizing/Adjusting", by model.) Start engine and allow it to warm up to operating temperature in forward gear.

NOTE: All carburetor settings must be made in FORWARD gear with the engine properly warmed-up.

3. With engine running, slowly turn the idle mixture screw counterclockwise until the affected cylinders start to load up or fire unevenly, due to an over-rich mixture.
4. Slowly turn idle mixture screw clockwise until the cylinders fire evenly and engine picks up speed.
5. Continue turning clockwise slowly until too lean a mixture is obtained and engine slows down and misfires.
6. Set idle mixture screw one to 1¼ turns counterclockwise from lean-out position to gain approximate true setting.
7. Do not adjust leaner than necessary to attain reasonably smooth idling. Too lean a setting is a major cause of hard starting.
8. When in doubt, it is preferable to have idle mixture set too rich rather than too lean.
9. If engine hesitates during acceleration after adjusting idle mixture, it is too lean, and idle mixture should be richened slightly until the engine accelerates correctly.
10. Idle engine and adjust "idle stop screw" on stop bracket so that engine idles at recommended RPM (see "Timing/Synchronizing/Adjusting", following, by models) in forward gear.
11. Run engine in forward gear (4000 to 5000 RPM) to clear engine and re-check idle RPM.

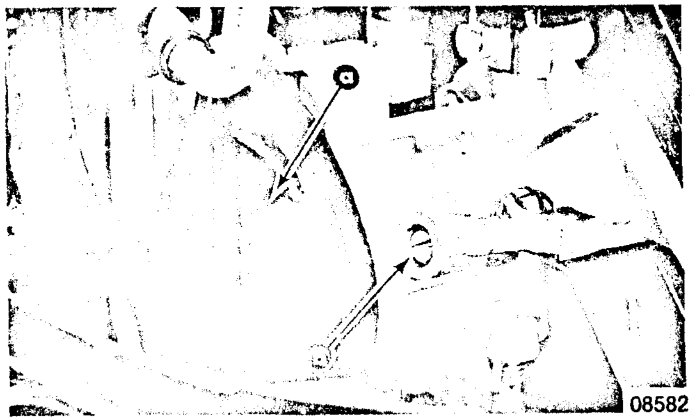
CARB. MAIN JET SIZES for ELEVATIONS

Merc Model	Yr. Model	Serial No. Range	Jet Type	Std. Up to 2500'	2500'-5000'	5000'-7500'	7500' & Up
40	1976-77-78	9075839 and Up	Main	.041	.040	.039	.038
45	1975-76-77-78	4107220 and Up	Main	.036	.035	.034	.033
75	1975	4131609 & Below	Main	.034	.033	.032	.031
75	1975-76	4131610-4397536	Main	.032	.031	.030	.030
75	1976-77-78	4397537 and Up	Main	.045	.043	.041	.039
110	1975-76-77-78	4079000 and Up	Main	.041	.039	.036	.035
200	1975	4351589 & Below	Main	.055	.053	.051	.049
200	1976-77-78	4351590 and Up	Main	.057	.055	.053	.051
402	1975-76-77-78	4117710 and Up	Main	.0785	.076	.074	.072
			Vent	.092	.090	.088	.086
500	1975	4280269 & Below	Main	.063	.061	.059	.057
500	1975	4280270 and Up	Main	.065	.063	.061	.059
			Vent	.086	.084	.082	.080
500	1976-77-78	4357640 and Up	Main	.055	.053	.051	.049
			Vent	.096	.092	.092	.090
650	1975	4382056 & Below	Main	.074	.072	.070	.068
			Vent	.086	.084	.082	.080
650XS	1975	4304235 and Up	Main	.086	.084	.082	.080
650 (Long Shaft)	1976	4382057 and Up	Main	.088	.086	.084	.082
			Vent	.052	.050	.048	.046
650 (Short Shaft)	1976	4382057 and Up	Main	.080	.0785	.076	.074
			Vent	.072	.070	.068	.066
700	1977-78	4571652 and Up	Main	.086	.084	.082	.080
			Vent	.066	.064	.062	.062
800	1978	4831999 and Up	Main	.090	.088	.086	.084
			Vent	.072	.070	.068	.066
850	1975	4366801 & Below	Main	.076	.074	.072	.070
			Vent	.092	.090	.088	.086
850	1976	4366802-4423111	Main	.088	.086	.084	.082
			Vent	.080	.0785	.076	.074
850	1976-77	4423112 and Up	Main	.090	.088	.086	.084
			Vent	.072	.070	.068	.066
900	1978	4845301 and Up	Main	.070	.068	.066	.064
			Vent	.092	.090	.088	.086
1150	1975-76-77-78	4112635 and Up	Main	.072	.070	.068	.066
			Vent	.092	.090	.088	.086
1400	1978	4865678 and Up	Main	.080	.078	.076	.074
			Vent	.092	.090	.088	.086
1500 (Long)	1975-76-77	4121435 and Up	Main	.080	.0785	.076	.074
1500XS (Short Shaft)	1975-76-77-78	4121435 and Up	Main	.082	.080	.0785	.076
			Vent	.092	.090	.088	.086
1500 (V-6)	1978	4868998 and Up	Main	.052	.050	.048	.046
			Vent	.098	.098	.098	.098
			Idle	.064			
1750 (V-6)	1976-77-78	4301235 and Up	Main	.074	.072	.070	.068
(Top Carb Only)			Vent	.090	.088	.086	.084
(Center/Bottom Carbs)			Vent	.082	080	.0785	.076
			Idle	.048	.050	.052	.054
2000 (V-6)	1978	4839034 and Up	Main	.078	.076	.074	.072
			Vent	.084	.082	.080	.078
			Idle	.046	.048	.050	.052

Main = Main Fuel Jet; Vent = Vent Jet, Float Bowl Cover; Idle = Idle Air Jet
Metric: 1' (Ft.) = .305m; 1" (Inch) = 2.54cm

REPAIRS and ADJUSTMENTS

For carburetor repair procedures (disassembly, cleaning, adjustments and reassembly), refer to "Fuel Systems" in Service Manual (by carburetor type).



a - Screen b - Idle Mixture Screw

Figure 2. Idle Adjustment (Typical)

HARD STARTING

2-Cylinder Models

1. When starting a cold engine, choke shutter must be fully closed. Adjust choke linkage and choke return spring for fast, positive action of choke shutter.
2. It may be necessary to readjust the carburetor idle mixture screw up to ¼-turn with each change in brand of gasoline to compensate for varying volatility and differences in refining process.

3-4 and 6-Cylinder Models

Hard starting is often traced to improper choke shutter operation. Adjust choke linkage and choke return spring for fast, positive action of the choke shutters.

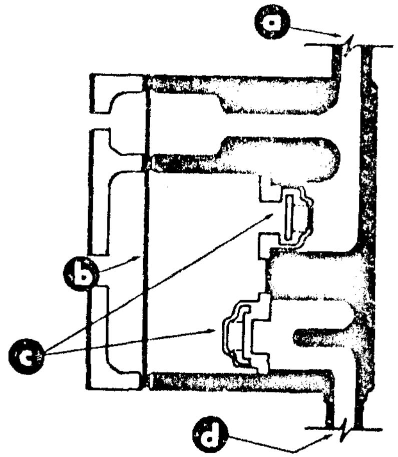
5. Fuel System

FUEL PUMPS - VACUUM TYPE (Figure 3)

1. Wash all parts thoroughly and use compressed air to dry.
2. Inspect each part carefully for wear or damage.
3. Replace pulsator diaphragm with new, if old diaphragm shows the least sign of deterioration.
4. Be sure that valve seats provide flat contact area for valve disc.
5. Tighten elbows and check valve connections firmly when replacing.
6. Do not use Permatex on valve retainer gasket.
7. Check valves after reassembling fuel pump cover by blowing thru outlet hole. Air should blow thru valve but should close immediately when attempting to draw air thru it.

a - Fuel Outlet
b - Diaphragm
c - Check Valves
d - Fuel Inlet

Figure 3. Fuel Pump for Most Models



8. Check inlet valve by reverse procedure. If leakage is encountered, check for free operation and accurate setting of valves.
9. Worn or slightly warped valve will cause leakage. Replace with new valves for more accurate seating.
10. When installing fuel line fittings, we recommend aviation Permatex for sealing. Apply sparingly to avoid clogging of fuel lines.

CAUTION: Do not use Liquid Neoprene on fuel line fittings. Neoprene is recommended only for exposed electrical connections. Permatex is available thru all local hardware stores.

11. Reassemble fuel pump(s), using new gasket(s).

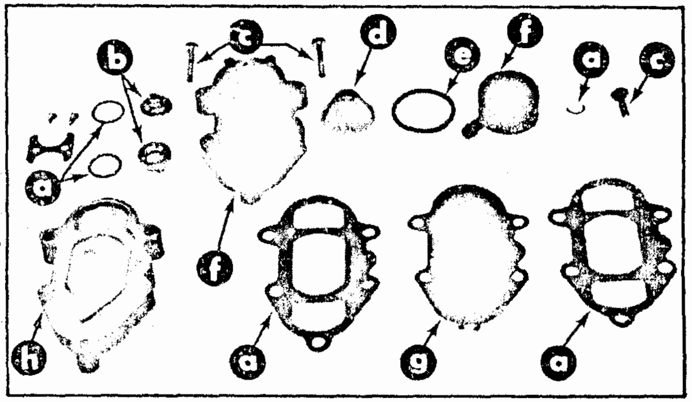
FUEL LINES and FILTERS

1. Inspect fuel lines for kinks, leaks and restrictions and correct any defects found. If necessary, remove fuel lines and blow out with compressed air to remove any foreign material. When reinstalling lines, be sure that they are not twisted or kinked, thereby causing restrictions.
2. Clean or replace fuel line filter element(s) as follows:
   a. Remove filter cover(s) and element(s).
   b. Wash parts in solvent and dry with compressed air.
3. Reinstall element(s).

NOTE: If a complaint of poor high speed performance exists, fuel pump pressure test should be performed.

FUEL PUMP DIAPHRAGM

A defective fuel pump diaphragm (Figure 4) is often mistakingly diagnosed as ignition trouble. A tiny pin-hole in diaphragm will permit gas to enter crankcase, causing that particular cylinder to wet foul the spark plug at idle speed. At higher speeds, gas quantity is limited and plug will fire normally.



a - Gasket | c - Screw | e - "O" Ring | g - Diaphragm
b - Check Valves | d - Filter Screen | f - Cover | h - Base

Figure 4. Fuel Pump A-66530A2

6. Ignition System

1. Use Mercury Marine Thunderbolt Ignition Analyzer (C-91-62563A1). All ignition components must be checked.
2. Maker Points (1975 Merc 45): Maker points (with some time on them) will show discoloration, but this is not a reason for replacement. Points, that show zero resistance across contacts, are satisfactory. Maker points, which show slight resistance, may affect idle operation. Points, which show high resistance, may cause a malfunction of ignition system and subsequent loss of spark.
3. Complete "Timing/Synchronizing/Adjusting", following, to assure correct engine operation.

See "Troubleshooting Thunderbolt Ignition", information, following.

7. Starter Motor and Solenoid

STARTER MOTOR

Testing Starter Motor

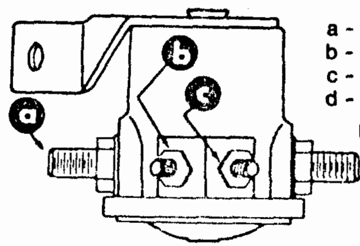
1. Be sure that battery is fully charged and at least 70 ampere hour capacity before testing starter motor. Many starter motors are needlessly disassembled when battery actually is at fault.
2. Using a voltmeter, connected to the starter motor positive terminal and ground, check battery voltage under load as follows: With voltmeter connected, turn ignition switch to Start position while observing voltmeter. If voltage is 9½ volts or more and starter motor fails to operate, repair or replace starter motor.

Cleaning and Inspection of Starter Motor

1. Remove starter motor and disassemble.
2. With starter motor completely disassembled, except for removal of field coils, component parts should be cleaned and inspected. DO NOT use grease dissolving solvent for cleaning armature or field coils, as insulation will be damaged.
3. Test pinion gear and screw shaft. Pinion gear must move freely on screw. Check pinion gear to see that it is not chipped or worn excessively. Check for bent armature shaft.
4. Check that brush holders are not deformed or bent and will properly hold brushes against commutator.
5. Check brush springs. If tension is insufficient, the brushes will arc and wear very rapidly.
6. Check condition of brushes. If pitted or worn to one half their original length, they should be replaced.
7. Check fit of armature shaft in bushing of drive end plate. Shaft should fit snugly in bushing. If bushing is worn, it should be replaced. Apply No. 10 oil to this bushing before reassembly. Avoid excessive lubrication.
8. Check fit of bushing in commutator end plate. If this bushing is damaged or worn excessively, end plate bushing or assembly should be replaced. Apply No. 10 oil to this bushing before reassembly. Avoid excessive lubrication. Lubricant forced onto commutator will gum and cause poor commutation, with resulting decrease in starter motor performance.
9. Inspect armature commutator. If commutator is rough or out-of-round, it should be turned down and under-cut. Inspect points, where armature conductors join commutator bars, to make sure that it is a good firm connection. Burned commutator bar usually is evidence of a poor connection.
10. To remedy any of preceding conditions, refer to the Service Manual.
11. Reassemble starter motor and lubricate pinion gear and screw shaft with No. 10 oil.
12. Check return spring for normal tension. Pinion must return from engaged position smoothly and rapidly.

TESTING SOLENOID

1. Turn selector switch of Magneto Analyzer to Position No. 2 (Distributor Resistance) and clip small red and black lead together.



a - Connect Small Red Test Lead
b - "S" Terminal
c - "I" Terminal
d - Connect Small Black Test Lead

Figure 5. Terminals on Solenoid

2. Turn meter adjustment knob for Scale No. 2 until meter pointer lines up with set position on left side of "OK" block on Scale No. 2.
3. Unclip small red and black leads. (Figure 5)
4. Connect small red test lead to one large terminal of solenoid and connect small black test lead to other large terminal, as shown in Figure 1.

> **CAUTION: Do not connect battery leads to large terminals of solenoid, or meter will be damaged.**

5. Using 12-volt battery and jumper leads, connect positive lead to small "S" terminal of solenoid.
6. Connect negative battery lead to "I" terminal of solenoid.
7. Meter pointer hand must move into the "OK" block, or solenoid is open-circuited and must be replaced.
8. With lead apart, "zero" meter to right side of Scale 2. Check between "S" and "I" terminal (2.1 to 2.7 ohms).

8. Alternator and Rectifier

TESTING ALTERNATOR

1. Alternator may be tested without removing flywheel.
2. Disconnect 2 yellow alternator leads from rectifier.
3. Turn selector switch of Magneto Analyzer to Position No. 2.
4. DO NOT clip small red and black leads together.
5. Turn No. 2 Scale meter adjustment knob to adjust meter needle with red line on right side of Scale No. 2.
6. Connect small red and black test leads to terminals of yellow or yellow/red alternator leads.
7. Read figures on Scale No. 2. Refer to specification chart, following, for model being tested. If alternator does not meet specifications, it should be replaced.

ALTERNATOR STATOR SPECIFICATIONS

Merc Model	Year	Stator Part No.	Ohm Value Rx1 Scale Average (1)	Gross Amperes Output at Rectifier*	Net Amperes Output at Battery*
75	1976-77-78	A-74367A2, A8	.65	3.5-4.5	3.5-4.5
110	1976-77-78	A-74367A2, A8	.65	3.5-4.5	3.5-4.5
200	1976-77-78	A-74367A3, A9	.65	3.5-4.5	3.5-4.5
402	1975-76-77-78	A-398-5255	.75	7-9	7-9
500	1975	A-398-2996	.4	7.5-10	7.5-10
500	1976-77-78	A-398-5919A2, A4	.75	7-9	7-9
650	1975	A-398-4634	1.3	6-8	3-5
650/700	1976-77-78	A-398-5704A2	.75	7-9	7-9
850	1975	A-398-5232	.3	12-14	8.5-10.5
800-850-850XS	1976-77-78	A-398-5919A3	.75	7-9	7-9
900-1400-1500XS	1978	A-398-4793	.3	12-14	7-9
1150-1500	1975-76-77	A-398-4793	.3	12-14	7-9
V-6's	1976-77-78	A-398-5454A2	.75	7-9	7-9

* *At wide-open throttle with somewhat discharged battery.*

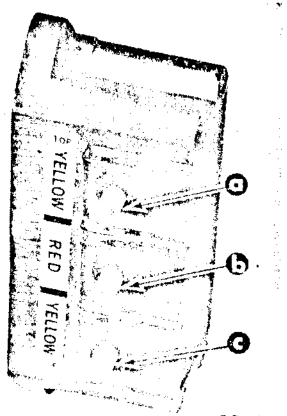
(1) Primary DC resistance of these windings generally is less than one (1) ohm. If a reading, resembling a short, is obtained, this would be proper. Copper wire is an excellent conductor, but will have noticeable differences from cold to hot. Reasonable variations from specified readings are acceptable.

RECTIFIER CHECK on THUNDERBOLT IGNITION MODELS

1. The rectifier will protect the switch box from damage if the harness plug becomes loose or is removed during engine operation, however, the rectifier will become damaged.
2. Disconnecting battery leads during engine operation or reversing the battery leads also will damage the rectifier.
3. An open circuit, such as a broken wire or loose connection on internal engine harness, can cause rectifier failure.
4. Leaving battery leads connected to the wrong terminals will damage the switch box.

NOTE: The engine can be operated without the rectifier if the alternator leads are disconnected and properly insulated. Tape each lead wire so that it cannot touch the other lead or engine ground.

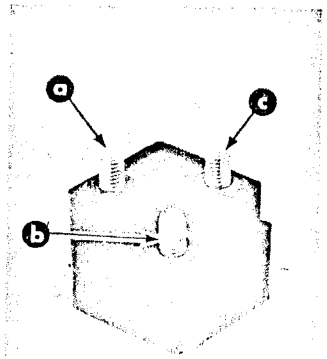
Mercury Marine will not honor warranty on rectifiers and switch boxes which are damaged under conditions described above. Rectifier can be tested without removing it from engine by removing alternator stator leads and disconnecting external engine harness and red lead from rectifier terminals.



02194

a - Terminal No. 1
b - No. 2
c - No. 3

Figure 6. Diode Type Rectifier Terminals - 6-Cyl. In-Lines



07300

a - Terminal No. 1 (Alternator)
b - Terminal No. 2 (Positive)
c - Terminal No. 3 (Alternator)

Figure 7. Diode Type Rectifier Terminals - Merc 402

TESTING DIODE TYPE RECTIFIERS (Figures 6-7-8)

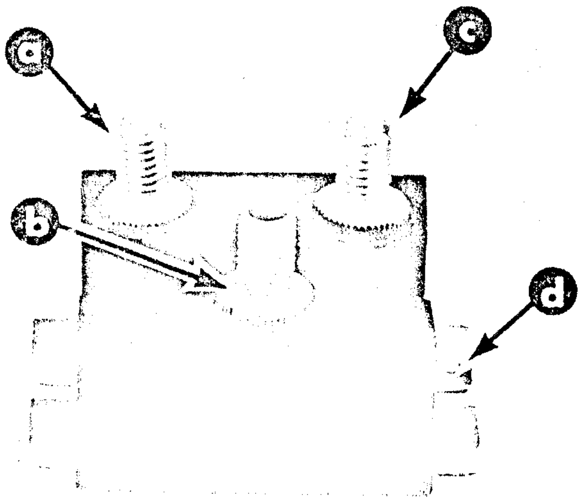
NOTE: Use VOA Electrical Tester (C-91-52751) to test rectifier. Red and yellow/red wires must be removed from rectifier before testing.

IMPORTANT: Before making any tests with VOA Tester, turn meter selector to range specified and adjust pointer to ohms set position with small red and black leads clipped together. Ohms set position MUST BE readjusted each time meter range is changed.

NOTE: Refer to Figures 6-7-8 for rectifier terminal identification.

Check	Range	Reading
1 -Red VOA lead to ground, black lead alternately to terminals one (1) and 3.	Rx1000	Continuity
2 -Black VOA lead to ground, red lead alternately to terminals one (1) and 3.	Rx1000	No Continuity
3 -Black VOA lead to terminal 2, red lead alternately to terminals one (1) and 3.	Rx1000	Continuity
4 -Red VOA lead to terminal 2, black lead alternately to terminals one (1) and 3.	Rx1000	No Continuity

NOTE: If rectifier test readings are not attained, replace the rectifier. Failure to obtain stated readings in Tests 1 and 3 in chart, above, indicates that diodes are open-circuited. Failure to obtain stated readings in Tests 2 and 4 indicates that diodes are short-circuited.



07300

a - Terminal No. 1 (Alternator)
b - Terminal No. 2 (Positive)
c - Terminal No. 3 (Alternator)
d - Ground

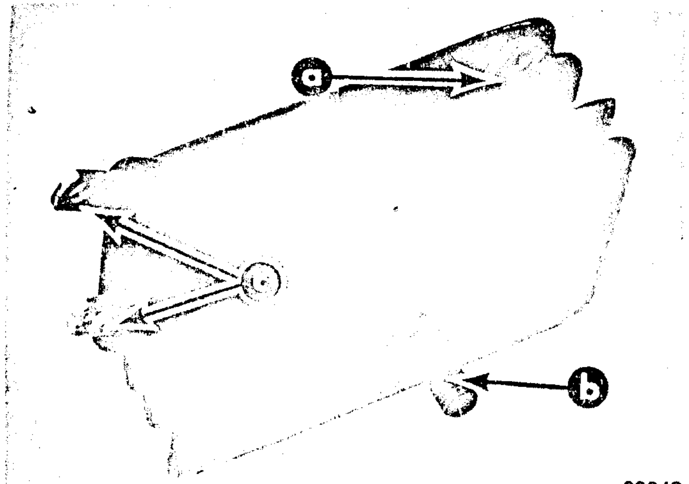
Figure 8. Diode Type Rectifier Terminals - Merc V-6's and 850-800-700-650-500-200-110-75

TESTING PLATE TYPE RECTIFIER (Figure 9)

(By Measuring Direct Current Resistance on Magneto Analyzer)

1. Set selector switch on Position No. 3 (Continuity).
2. Clip small red and black test leads together and turn meter adjustment knob for Scale No. 3 until meter pointer hand lines up on set position on Scale No. 3, right side.
3. Connect small red and black test leads from analyzer to positive terminal and ground stud.
4. Note reading of figures on lower hand, Scale No. 3.
5. Reverse test leads on rectifier and note readings again.

6. Ratio of two readings should be 10:1 or greater.
7. Remove analyzer test leads and connect to the two alternator terminals on rectifier. Note reading of figures on lower hand Scale No. 3.
8. Reverse test leads on rectifier and note readings again.
9. The ratio of the two readings should be no more than 2:1.
10. This is only a preliminary test to determine condition of rectifier. If questionable, as a final test, rectifier should be installed on engine and checked with ammeter while engine is running.



00042

a - Positive Terminal b - Ground Stud c - Alternator Terminals

Figure 9. Testing Plate Type Rectifier

RECTIFIER OUTPUT CHECKS

Net DC Amperage Output on All 2-4 and 6-Cylinder Engines

(Use VOA Tester [C-91-52751] ONLY.)

1. With engine stopped, disconnect red harness lead from positive (+) terminal of battery and connect negative (-) ammeter terminal to red harness lead.
2. Connect positive (+) side of ammeter to positive (+) terminal of battery. Turn ignition key to "On" position (START ENGINE) and read ammeter.
3. With a partially discharged battery, ammeter should change from discharge to charge at between 800-to-1000 RPM. With a fully-charged battery, this RPM may be somewhat higher. Increase engine RPM to 5200-to-5500, at which time reading should be approximately 10-to-12 amperes with partially discharged battery. With fully-charged battery, a somewhat lower reading will be obtained because of self-regulating characteristics of generating systems. See chart, preceding, for output by model.

Gross DC Amperage Output of Rectifiers on All 2-4 and 6-Cylinder Engines

(Use VOA Tester [C-91-52751] ONLY.)

1. Connect an ammeter between red output lead from the rectifier and electrical internal harness red lead.

2. Open disconnects and connect ammeter, attaching lead from rectifier to one terminal of ammeter and lead from internal harness to second terminal.
3. Start engine and check amperage output. See chart, preceding, for output by model.

RECTIFIER REPLACEMENT

CAUTION: Make sure that battery is disconnected before connecting or disconnecting any wires in electrical system.

Rectifier replacement is a nut-and-bolt operation.

9. Internal Wiring Harness

If trouble has been experienced with any of the electrical components, the internal wiring harness should be checked carefully. Check for frayed or chafed insulation and/or loose connections between wires and terminal ends.

The harness connector should also be checked for possible corrosion and/or bent or broken electrical "prongs". If any of these conditions exist, they must be corrected before proceeding with the following tests.

Be sure that "prongs" of harness connector are clean and free of corrosion for a good electrical connection between harness connector and remote control harness.

SHORT TEST (See Wiring Diagram at End of This Book.)

1. Disconnect internal wiring harness from electrical components.
2. Using Magneto Analyzer, Scale No. 3, check for continuity between any of the wires in the harness.
3. Use Scale No. 3 and check for continuity between any wire and ground.
4. If continuity exists, harness will have to be repaired or replaced.

RESISTANCE TEST (See Wiring Diagrams, Following)

1. Turn selector switch of Magneto Analyzer to Position No. 2 (Distributor Resistance) and clip small red and black leads together.
2. Turn meter adjustment knob for Scale No. 2 until meter pointer lines up with set position on left side of "OK" block on Scale No. 2.
3. Unclip small red and black leads.
4. Using wiring diagram as a guide, check each wire for resistance between harness connection and terminal ends.
5. If resistance exists, meter reading is outside "OK" block and harness must be repaired or replaced.

10. Adjustments before Testing

Refer to "Timing/Synchronizing/Adjusting" for particular models, following. Importance of correct timing and synchronization cannot be overemphasized, as a motor, even in excellent mechanical condition, will not perform satisfactorily unless timing and synchronization are correct.

11. Boat Test

1. Mount motor on boat.
2. Install remote control cables and check for proper adjustment.
3. Electric Models:
   a. Inspect battery and cables and perform necessary service on these components.
   b. Inspect for signs of corrosion on battery, cables and surrounding area, loose or broken carriers, cracked or bulged cases, dirt and acid, electrolyte leakage and low electrolyte level.
   c. Fill cells to proper level with distilled water or water passed thru a "demineralizer".
   d. Top of battery should be clean and battery fastened securely in position. Particular care should be taken so that tops of 12-volt batteries are kept clean of acid, film and dirt because of high voltage between battery terminals.
   e. For best results, when cleaning batteries, wash first with a dilute ammonia or soda solution to neutralize any acid present, then flush off with clean water.
   f. Keep vent plugs tight so that neutralizing solution does not enter cell.
   g. Hold-down device should be kept tight enough to prevent battery from shaking around in its holder, but it should not be tightened to a point where battery case will be placed under a severe strain.
   h. To ensure good contact, battery cables should be tight on battery posts. If battery posts or cable terminals are corroded, cables should be cleaned separately with a soda solution and wire brush. After cleaning and before installing clamps, apply a thin coating of Multipurpose Lubricant (C-92-63250) to posts and cable clamps to help retard corrosion.
   i. If battery has remained under-charged, check for high resistance in charging circuit.
   j. If battery has been using too much water, it may be defective or undersize.
4. Check fuel tank(s) for dirt, water and/or "stale" fuel.

NOTE: If any doubt exists, clean fuel tanks and refill with fresh fuel before continuing test.
If other than Mercury Marine fuel tanks are used, see "12", Additional Checks and Adjustments.

5. If possible, boat should be tested with average gross load.
6. Check motor tilt angle adjustment. Boat should ride on even keel.
7. If motor is equipped with adjustable trim tab, tab should be adjusted so that boat steers with equal ease in either direction.
8. Check engine RPM at full throttle. RPM should be within specified range. If RPM is not within specified range, check propeller pitch.

Higher pitch propeller will decrease RPM, lower pitch propeller will increase RPM.

For optimum low speed motor performance, we recommend that idle mixture and idle RPM be readjusted under actual operating conditions.

"HOOK" and "ROCKER"

Check boat bottom carefully before testing. Any marine growth, or a "hook" or a "rocker" in boat bottom, can greatly reduce performance.

12. Additional Checks and Adjustments

Following tests are described herein for use as required where either an abnormal condition, requiring further checking, has been detected during Tuneup, or a specific complaint exists:

Water Pressure (Use Water Pressure Gauge A-55664A1 or A-65614A1)
Fuel Pressure (Use Fuel Pressure Gauge C-91-30692)

WATER PRESSURE TEST (A-55664A1 or A-65614A1)

1. Water pressure at the cylinder block should be checked whenever an overheating condition is detected or suspected.
2. A large keel or other accessories, located on the boat bottom forward of the motor, can cause what is mistakenly diagnosed as water pump failure.
3. A motor mounted unusually high on the transom also can cause overheating. A solid, unrestricted water flow must be delivered to the gear housing for maximum cooling and engine efficiency.
4. Install necessary fitting and water pressure hose on the cylinder block and place water pressure gauge in convenient position for viewing while operating boat. Water pressure at full throttle under any running conditions, i.e., turning, maneuvering, etc, must be 5 psi (lbs. per sq. in.) ($0.35kg/cm^2$) or more.

FUEL PRESSURE (C-91-30692)

1. Fuel pressure at the top carburetor should be checked whenever insufficient fuel is suspected, or if other than Mercury Marine fuel tank is used. Check "foreign" fuel tanks for the following:
   a. Adequate air vent in fuel cap.
   b. Fuel line large enough (5/16-to-3/8") (8-to-9.5mm).
   c. Filter on end of pickup too small or clogged, or fuel pickup tube too small. Use A-32-33909A4 Fuel Pickup Assembly as a comparison.
2. Insufficient fuel supply will cause engine to run lean, lose RPM or cause piston scoring.
3. The fuel pressure gauge should be installed at the end of the fuel line that leads to the upper carburetor. Fuel pressure must be 2 psi (lbs. per sq. in.) ($0.141kg/cm^2$) or more at full throttle.

LOW SPEED PERFORMANCE

For optimum low speed motor performance, we recommend that idle mixture and idle RPM be readjusted under actual operating conditions.

OPERATION at RECOMMENDED RPM

The correct propeller should be installed on the engine so that it will run at recommended RPM.

Merc Model	Max. RPM Range			
	1978	1977	1976	1975
40 (2-Cyl.)		4300-4700	4300-4700	
45	4500-5500	4500-5500	4500-5500	4500-5500
75	4500-5500	4500-5500	4500-5500	4500-5500
110	4500-5500	4500-5500	4500-5500	4500-5500
200	4800-5500	4800-5500	4800-5500	4800-5500
402	5000-5500	4800-5300	4800-5300	4800-5300
500	5000-5500	4800-5500	4800-5500	4800-5500
650			4800-5300	4800-5300
650XS			6000-7000	
700	5000-5500	4800-5500		
800	5000-5500			
850		5000-5500	5000-5500	5000-5500
850XS		5000-5500	5000-5500	
900	4500-5000			
1150	5000-5500	4800-5300	4800-5300	4800-5300
1400	5300-5800			
1500		5300-5800	5300-5800	5300-5800
1500XS	5800-6300	4800-6000	4800-6000	
1500 V-6	5000-5500			
1750 V-6	5300-5800	4800-5800	4800-5800	
2000 V-6	5300-5800			

The lower RPM is recommended for large, heavy, slow boats or for commercial applications. The higher RPM is recommended for light, fast boats. The wide RPM range will result in greater satisfaction derived from maximum performance and maximum fuel economy.

If the engine speed is too high, try a higher pitch or the same pitch cupped. Likewise, if engine speed is low, try a lower pitch prop. There normally is a 300-500 RPM change between propeller pitches.

For dual installation, the next higher pitch propeller may be best. For water skiing, it may be desirable to use the next lower pitch; however, use caution -- do not operate at full throttle when using ski propeller and not pulling skiers. In this case, the propeller has too little pitch for the application, and dangerous overspeed of the engine may result. If the propeller has too much pitch for the application, acceleration will be slow.

Spark Plug and Ignition Data

1975-6-7-8 Merc Model	Spark Plug Type	
	AC	Champion
All V-6's	V40FFM	L76V
1500-1500XS	V40FFM	L76V
1400-1150	V40FFM	L76V
900	V40FFM	L76V
850-800	V40FFK	L78V
850 (1975-76)	V40FFM	L76V
700-650	V40FFM	L76V

1975-6-7-8 Merc Model	Spark Plug Type	
	AC	Champion
500	V40FFM	L76V
500 (1978)	V40FFK	L78V
402	V40FFM	L76V
200	V40FFK	L78V
110	V40FFK	L78V
75-45	V40FFK	L78V
40	M43FF	L7J§

NOTE: Turn in all spark plugs finger-tight before applying torque wrench. Torque plugs to 20 ft. lbs. (2.76mkg).

§ Champion QL7J5 or QL7J for countries other than U.S.

Merc 45 Capacitor/Module Test

Capacitor/ Module Part No.	Test Meter*	Scale	Test Leads to —	Scale Reading
A-336-4516A2	1 or 2	X 1000	Red to Red Terminal and Black to Capacitor Terminal	Cont.
			Black to Red Terminal and Red to Capacitor Terminal	No Cont.
			Red to Blue Terminal and Black to Capacitor Terminal	Cont.
			Black to Blue Terminal and Red to Capacitor Terminal	No Cont.
A-336-4463	3	4	Black Lead to Ground and Red to Green Cap. Lead	.45-.55
		5	Black Lead to Ground and Red to Green Cap. Lead	Left Side

* *TEST METERS:* *§ Zero meter before using*

1. *VOA Meter (C-91-52751), black case §*
2. *Thunderbolt Ignition Analyzer Meter (C-91-62563A1), red case §*
3. *Merc-O-Tronic Ignition Analyzer (C-91-25213) §*

Thunderbolt Ignition Stator and Stator Coil Checks

IMPORTANT: Disconnect Stator Leads before Testing Stator Assembly. Disconnect Stator Coil Wires before Testing Coils.

Merc Model and Year	Part No. ▲Stator Assembly ■Stator Coil	Ohm Scale	Tester Leads to —	Scale Reading
40 (1976-77-78)	▲339-5566A__	R x 100	Between Yellow Stator Wire and Ground	15-20
	■339-5589A__ ■339-5590A__	R x 100	Between Yellow and White Coil Wires	7.5-10
45 (1975-76-77-78)	■A-336-4470A__	R x 100	(High Speed) Between Yellow and Blue Coil Leads	6-8
	■A-336-4469A__	R x 1000	(Low Speed) Between Yellow and Red Coil Leads	5.3-6.1
75-110 (1975-76-77-78)	▲A-339-5209A__ ▲A-339-5566A__	R x 100	Between Yellow Stator Lead and Ground	15-20
	A-339-5312A__ A-339-5313A__ ■A-339-5589A__ A-339-5590A__ A-339-6119A__ A-339-6120A__	R x 100	Between Yellow and White Coil Wires	7.5-10
200 (1975-76) S/N 4377556 and Below)	■A-338-4992A__	R x 1	Between Red and Blue Coil Wires	180-340
	■A-338-4991A__	R x 1000	Between White and Blue Coil Wires	5.2-7.2
200 (1976-77-78 S/N 4403787 and Above)	▲A-339-5209A__	R x 100	Between Yellow Stator Lead and Ground	15-20
	■A-339-6119A__ ■A-339-6120A__	R x 100	Between Yellow and White Coil Wires	7.5-10

(Continued on Next Page)

402 (1975-76-77-78)	▲A-398-4770 ▲A-398-4799 ▲A-398-5255 ▲A-398-5256	R x 1000	Between Blue Stator Lead and Ground	5-6
		R x 1	Between Red Stator Lead and Ground	50-60
500 (1975) §	■A-333-3175 ■A-333-3176 Ignition Driver Coils	R x 100	(Low Speed) Between Red and White (Ignition Driver) Leads	3.4-4.5
		R x 1	(High Speed) Between Blue and White (Ignition Driver) Leads	10-11
		R x 1000	Between Red Lead and (Ignition Driver) Case (ground)	No Cont.
		R x 1000	Between White Lead and Ignition Driver Case (ground)	No Cont.
		R x 1000	Between Blue Lead and Ignition Driver Case (ground)	No Cont.
500 (1976-77-78)	▲A-398-5919A__	R x 1000	(Low Speed) Between Blue Stator Wire and Blue/White Stator Wire	5.7-8.0
		R x 1	(High Speed) Between Red Stator Wire and Red/White Stator Wire	56-76
		R x 1000	Between Blue Stator Wire and Engine Ground	No Cont.
		R x 1000	Between Red Stator Wire and Engine Ground	No Cont.
650-700 (1976-77-78)	▲A-398-5704A__	R x 1000	(Low Speed) Between Blue Stator Wire and Red Stator Wire	5.4-6.2
		R x 1	(High Speed) Between Red Stator Wire and Engine Ground	125-175
800-850-850XS (1976-77-78)	▲A-398-5919A3	R x 1000	(Low Speed) Between Blue Stator Wire and Blue/White Stator Wire	5.7-8.0
		R x 1	(High Speed) Between Red Stator Wire and Red/White Stator Wire	56-76
		R x 1000	Between Blue Stator Wire and Engine Ground	No Cont.
		R x 1000	Between Red Stator Wire and Engine Ground	No Cont.
1500 (V-6) 1750-2000 (1976-77-78)	▲A-398-5454A__	R x 1000	(Low Speed) Between Blue Stator Wire and Red Stator Wire	5.4-6.2
		R x 1000	(Low Speed) Between Blue/White Stator Wire and Red/White Stator Wire	5.4-6.2
		R x 1	(High Speed) Between Red Stator Wire and Engine Ground	125-175
		R x 1	(High Speed) Between Red/White Stator Wire and Engine Ground	125-175

§ *Not necessary to disassemble ignition driver. Leads must be disconnected from switch box.*

Thunderbolt Ignition Coil Checks

(Disconnect Coil "Pos" and "Neg" and Coil Secondary Wire [Wire to Spark Plug or Distributor] prior to Testing.)

Merc Model	Coil Part No.	Test	Ohm Scale	Tester Leads to –	Scale Reading
40 (1976-77-78)	A-339-5288A2	Primary	Rx1	"Pos" and "Neg" Terminals	.02-.04 Δ
	A-339-5748A2	Secondary	Rx100	Ground (or Pigtail if Not Mounted) and Coil Tower	9-12
45 (1975-76-77-78)	A-336-4528A1, A2 (Green Color)	Primary	Rx1	"Pos" and "Neg" Terminals	.01-.02 Δ
		Secondary	Rx100	Ground (or Pigtail if Not Mounted) and Coil Tower	5-6
75-110-200-402 (1975-76-77-78)	A-339-5288A1 A-339-5288A2	Primary	Rx1	"Pos" and "Neg" Terminals	.02-.04 Δ
	A-339-5748A2	Secondary	Rx100	Ground (or Pigtail if Not Mounted) and Coil Tower	9-12
500-650-850 (1975)	A-332-4895A1	Primary	Rx1	"Pos" and "Neg" Terminals	.01-.02 Δ
	A-332-4895A2	Secondary	Rx10	Ground (or Pigtail if Not Mounted) and Coil Tower	57-73
500-650-700-800-850 (1976-77-78)	A-339-5288A2	Primary	Rx1	"Pos" and "Neg" Terminals	.02-.04 Δ
	A-339-5748A2	Secondary	Rx100	Ground (or Pigtail if Not Mounted) and Coil Tower	9-12
900-1150-1400-1500-1500XS (1975-76-77-78)	A-332-4895A1	Primary	Rx1	"Pos" and "Neg" Terminals	.01-.02 Δ
	A-332-4895A2	Secondary	Rx10	Ground (or Pigtail if Not Mounted) and Coil Tower	57-73
V-6's (1976-77-78)	A-339-5288A2	Primary	Rx1	"Pos" and "Neg" Terminals	.02-.04 Δ
	A-339-5748A2	Secondary	Rx100	Ground (or Pigtail if Not Mounted) and Coil Tower	9-12

Δ *The primary DC resistance of these coils generally is less than one (1) OHM. If a reading resembling a short (complete circuit) is obtained, this would be proper. Copper wire is an excellent conductor, but will have a noticeable difference in resistance from cold to hot temperatures. Reasonable variations from these specified readings are acceptable.*

TIMING/SYNCH./ADJUSTING

Merc 40 (2-Cyl.)

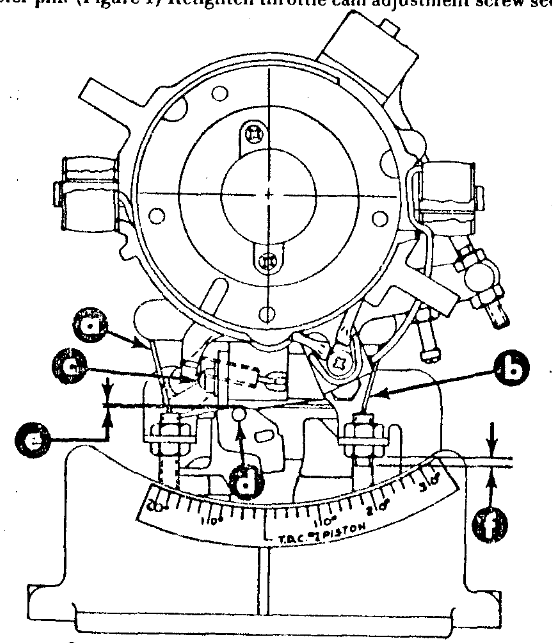
Firing Order	Alternate Firing
Spark Plug	Champion L7J or AC-M43FF (United States Only)*
Spark Plug Gap	.050" (1.27mm)
Idle Timing	15° to 18° ATDC §
Timing Maximum Advance (WOT)	22° to 26° BTDC
Throttle Pickup	14° ± 2° ATDC
Full Throttle RPM	4300 to 4700 RPM
Idle RPM	600 to 700 RPM in Gear
Water Pressure (at Flush Hole)	.5 to 1.0 psi at Idle in Gear; 2.0 to 3.0 psi at WOT in Gear

* *For countries other than the United States, use Champion QL7J5 or QL7J.*

§ *Set idle timing 2° below the advanced reading which is obtained as idle speed approaches 600 RPM.*

STATIC TIMING PROCEDURE

1. Place throttle lever in full retard position and carburetor shutter plate fully closed. Loosen throttle cam adjustment screw (Figure 1) and adjust throttle cam to provide .005" to .015" clearance between throttle cam and cluster pin. (Figure 1) Retighten throttle cam adjustment screw securely.



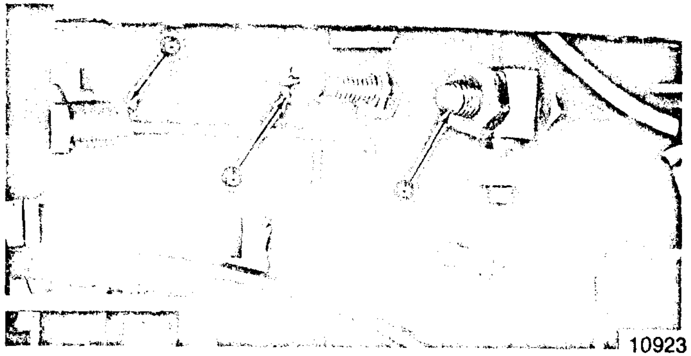
a - Advance Cable
b - Retard Cable
c - Throttle Cam Adjustment Screw
d - Cluster Pin
e - .005" to .015" (.127mm to .381mm) Clearance between Cluster Pin and Throttle Cam at Closed Position
f - 3-to-4 Threads (1/8") Exposed on Retard Cable

Figure 1. Adjustment Locations

2. Adjust retard cable (Figure 1) so that approximately 3-to-4 threads [⅛" (3.2mm)] are exposed, as shown in Figure 1. Tighten jam nuts securely.
3. With twist grip held against idle stop, adjust advance cable (Figure 1) until no slack exists in cable. Tighten jam nuts securely.
4. Remove remote idle lever from idle screw (on carburetor) and preset carburetor idle screw at 1¼ turns (± ⅛ turn) out from lightly seated position.

DYNAMIC TIMING PROCEDURE

1. Place engine in a test tank and remove engine cowl.



a - Trigger Link Rod b - Maximum Spark Advance Screw
c - Retard Cable
Figure 2. Adjustment Locations

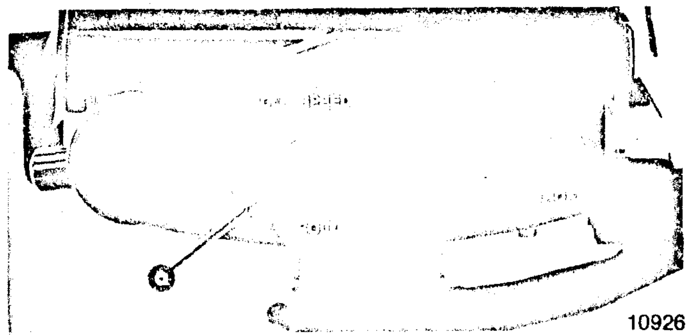
2. Connect Timing Light (C-91-35507) to engine by connecting red lead to No. 1 (top) spark plug and connecting black leads to 12-volt battery positive (+) and negative (-) terminals. Connect tachometer to engine.

IMPORTANT: Immediately after starting engine, make certain that water pump is operating (check for water discharge from exhaust relief holes at rear of drive shaft housing).

3. Start engine, shift into forward gear and run at ½-throttle for approximately 5 minutes to warm up engine.
4. Set idle timing as follows:
   a. With engine in gear and running at 1000 to 1500 RPM, observe ignition timing while quickly closing throttle against idle stop. The timing will fully retard to approximately 18° to 20° ATDC, then will advance slightly to 15° to 18° ATDC as the idle speed approaches 600 RPM.
   b. Adjust trigger link rod (Figure 2) to set idle timing at 2° below the advance reading which is obtained as idle speed approaches 600 RPM.

EXAMPLE: Timing fully retards to 18° ATDC as throttle is closed, advances to 15° ATDC at 600 RPM; set idle timing at 17° ATDC.

5. Advance throttle grip until 22° to 26° BTDC is reached, then adjust maximum spark advance screw (Figure 2) to contact stop. Tighten jam nut (on spark advance screw) securely.
6. Turn twist throttle grip against idle stop. Advance throttle grip until throttle cam contacts cluster pin, then check timing. Timing should be 14° ± 2° ATDC. If throttle pickup is incorrect, readjust throttle cam, as required, to obtain throttle pickup at 14° ± 2° ATDC.
7. Adjust carburetor setting as outlined, preceding.
8. With the idle adjustment knob (Figure 3) in "Run" position, reinstall the remote idle lever onto carburetor idle screw in the 9 o'clock position.
9. Disconnect timing light and tachometer from engine and reinstall engine cowl.



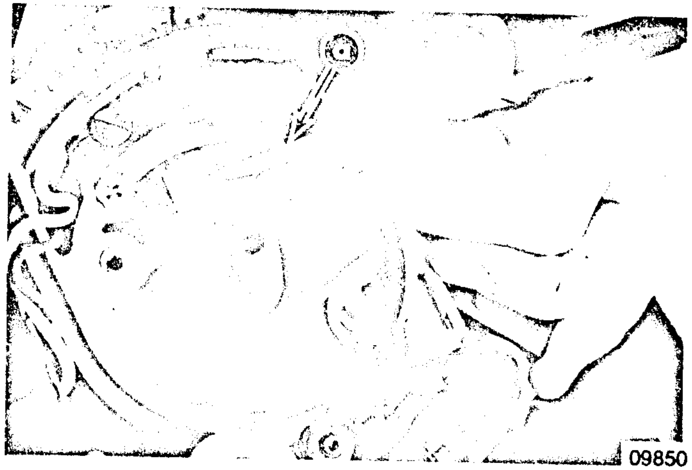
a - Idle Adjustment Knob
Figure 3. Idle Adjustment Knob Location

TIMING/SYNCH./ADJUSTING
Merc 45 with Phase-Maker Ignition

Firing Order	Single Cylinder
Spark Plug	AC-V40FFK & Champion L78V
Spark Plug Gap	Not Adjustable
Timing Maximum Advance	.198" BTDC
Throttle Pickup	5° ATDC
Full Throttle RPM	4500-5500 RPM
Idle RPM	650-800 RPM in Forward Gear (Approximately 9° to 12° ATDC)
Water Pressure (at Tell-Tale)	4 to 7 psi (.281 to .492kg/cm²) at 5000 RPM

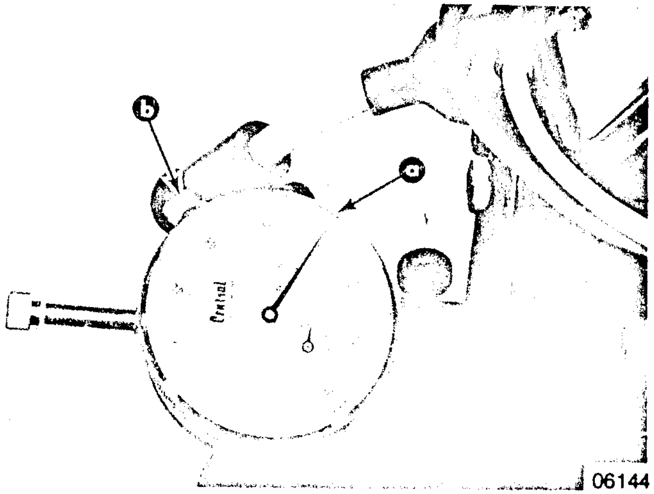
TIMING ADJUSTMENTS

1. Remove top cowl, flywheel and module cover to expose maker-point set. (Figure 1)
2. Rotate crankshaft to place cam follower at high point on cam (Figure 1). Adjust point gap to .020" (.51mm) and reinstall flywheel. Torque flywheel nut to specification in "Specifications" section of Service Manual.
3. Remove spark plug and install Dial Indicator (C-91-58222) into spark plug hole.
4. Rotate crankshaft clockwise to find piston TDC (top dead center). Set dial indicator at zero and lock set screw. (Figure 2)
5. Rotate crankshaft counterclockwise to place piston at .198" (5.03mm) BTDC.
6. Using VOA Meter (C-91-52751), set meter on R x 1000 scale. Clip test leads together and zero meter to right side of scale. Connect red test lead to ignition coil white wire terminal and black lead to engine ground.
7. Turn twist grip throttle to open throttle to maximum spark advance point. (Figure 3)



a - Feeler Gauge (.020")

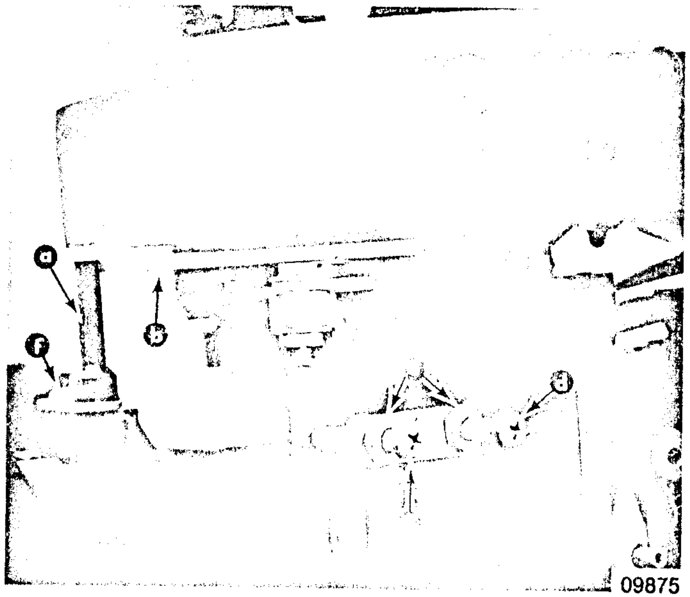
Figure 1. Setting Point Gap



a - Zero b - Set Screw

Figure 2. Dial Indicator Installed

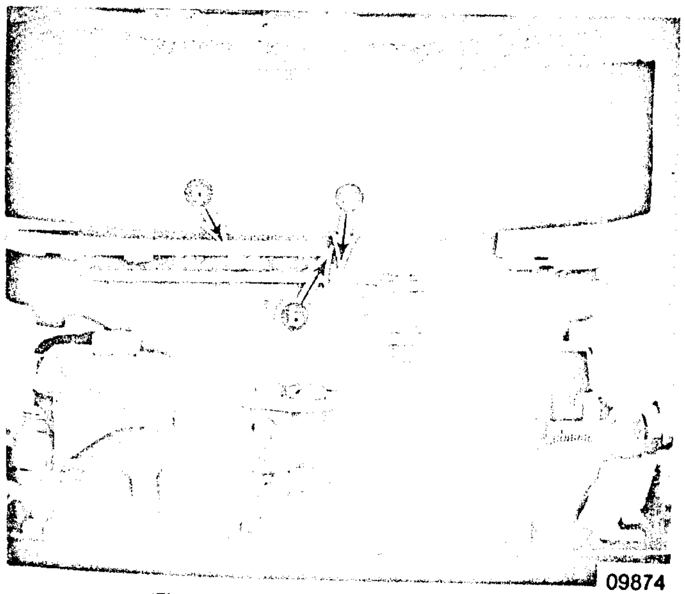
8. Use twist grip to keep throttle against maximum spark advance screw while adjusting screw until meter indicates points just close (meter needle swings down scale [to right]). Tighten stop screw locknut.
9. Adjust carburetor vertical shaft to allow approximately .050" (1.27mm) play between vertical shaft and throttle cam. (Figure 3) Retighten screw to lock vertical lever in position.
10. Rotate crankshaft clockwise to place piston at .005" (.127mm) ATDC.
11. With VOA meter connected as in Step 6, close the throttle with twist grip until meter indicates points closed.
12. Adjust throttle cam to just touch vertical throttle lever. (Figure 4)
13. Remove dial indicator and install spark plug.
14. Pre-set carburetor idle mixture screw to one turn (± ⅛ turn) from lightly seated position.
15. Start engine and allow it to warm up in forward gear. Set idle mixture screw for best idle (refer to "Fuel System" in Section 5).



a - Carburetor Vertical Shaft
b - Throttle Cam
c - Maximum Spark Advance Screw
d - Idle RPM Screw
e - Locknuts
f - Vertical Shaft Lockscrew

Figure 3. Adjusting Maximum Spark Advance

16. Check that twist grip decal "Start" aligns with cast arrow (with engine running at 2500-3000 RPM in neutral).
17. Set idle RPM screw to attain 650-800 RPM in forward and tighten locknut.



a - Throttle Cam b - Just Touching
c - Throttle Lever

Figure 4. Adjusting Throttle Pickup

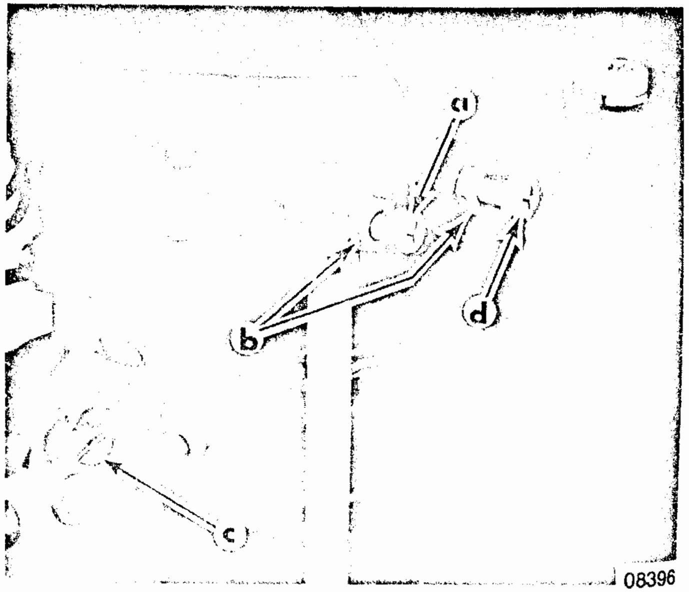
TIMING/SYNCH./ADJUSTING Merc 75 (Below Serial No. 4314385) and Merc 110 (Below Serial No. 4304785)

Firing Order	Alternate Firing
Spark Plug	AC-V40FFK or Champion L78V*
Spark Plug Gap	Not Adjustable
Timing Maximum Advance	35° BTDC
Throttle Primary Pickup	Not Adjustable
Full Throttle RPM	4500-5500 RPM
Idle RPM	650-750 RPM in Forward Gear
Water Pressure (at Tell-Tale)	4 to 8 psi (.281 to .562kg/cm²) @ 4500 RPM

* *Merc 75's (below 4131610) and Merc 110's (below 4126460) use AC-V40FFM or Champion L76V*

TIMING ADJUSTMENTS

1. Place engine in test tank and attach fuel line.
2. Install Timing Light (C-91-35507) by connecting large red lead to No. 1 spark plug, then connect one small lead to battery negative (-) post and other lead to positive (+) post.
3. Start engine and shift into forward gear. Turn twist grip to full throttle.
4. Adjust maximum spark advance screw (Figure 1) until timing line on flywheel aligns with timing specification on starter housing decal. (Figure 2)



a - Maximum Spark Advance Screw   c - Idle Mixture Screw
b - Locknuts   d - Idle RPM Screw

Figure 1. Maximum Spark Screw and Idle Speed Screw

5. Tighten jam nut on spark advance screw after adjustment is made.
6. Close throttle with twist grip. Shut engine off and remove timing light.

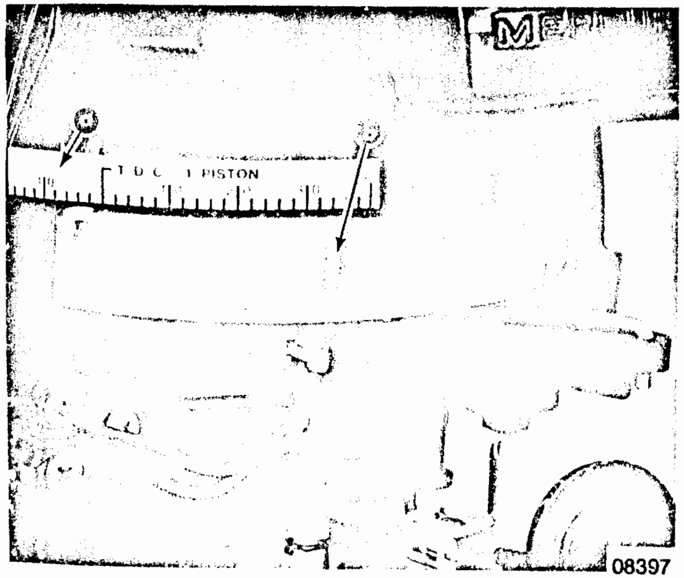
CARBURETOR ADJUSTMENTS

1. Start engine and adjust idle mixture screw for best idle. Refer to carburetor adjustment information, preceding. This engine is equipped with an integral fuel pump carburetor. Follow proper idle mixture instructions. Do not set carburetor leaner than necessary, as a lean setting causes hard starting.
2. Set engine idle RPM stop screw to attain 650 to 750 RPM in forward gear.

MAXIMUM NEUTRAL RPM LIMITER

1. With engine running in neutral gear, loosen neutral RPM limiter screw (located in the bottom cowl). Move limiter toward rear of engine and tighten the screw only enough to place light tension on the limiter. (Figure 3)
2. Turn twist grip to attain 2400 to 2700 RPM, then tighten the limiter screw securely. Recheck limiter RPM by returning to idle, then opening throttle to the limit stop. Readjust if necessary.
3. Check that neutral RPM limiter does not interfere with throttle operation in forward gear. If it should interfere, move end of limiter toward cylinder block and recheck neutral RPM.

NOTE: This adjustment must be accurate to assure easy starting when engine is cold.



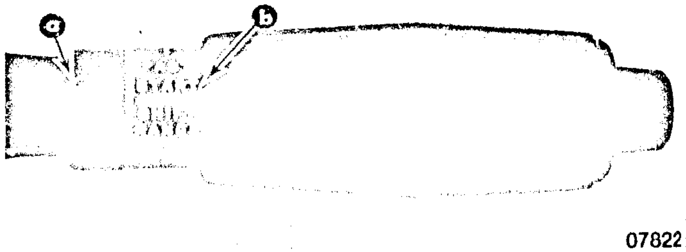
a - Timing Decal   b - Timing Mark

Figure 2. Timing Mark Alignment



a - Neutral RPM Limiter b - Screw

Figure 3. Neutral RPM Limiter Adjustment



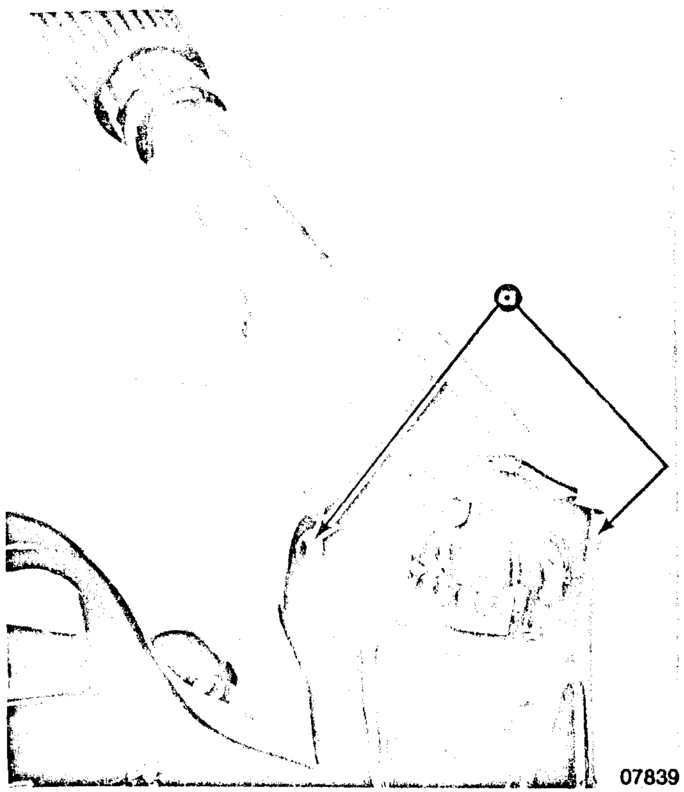
a - Arrow b - "Start"

Figure 4. Tiller Handle and Twist Grip Alignment

TILLER HANDLE DECAL PLACEMENT

1. With engine running in neutral gear, turn twist grip to attain 2400 to 2700 RPM. At this point the "Start" position on twist grip should align with indicator arrow on tiller handle. (Figure 4)
2. Reposition twist grip, if necessary, by removing 2 allen head screws at tiller handle knuckle. (Figure 5)
3. Pull handle apart far enough to clear teeth of gears. Turn twist grip to align marks and install screws.

NOTE: This adjustment must be accurate to assure easy starting when engine is cold.



a - Allen Head Screws

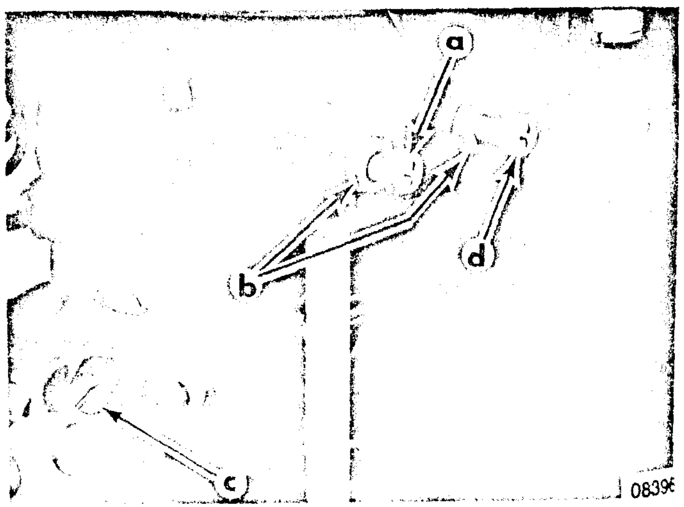
Figure 5. Tiller Handle Adjustment

TIMING/SYNCH./ADJUSTING Merc 75 (Serial No. 4314385-thru-4397536) and Merc 110 (Serial No. 4304785-thru-4387436)

	Merc 75	Merc 110
Firing Order	Alternate Firing	
Spark Plug	AC-V40FFK or Champion L78V	
Spark Plug Gap	Not Adjustable	
Timing Maximum Advance	30° BTDC	35° BTDC
Throttle Pickup	Not Adjustable	
Full Throttle RPM	4500-5500 RPM	
Idle RPM	650-750 RPM (in Gear) (Approx. 10° ATDC)	650-750 RPM (in Gear) (Approx. 15° ATDC)
Water Pressure (at Tell-Tale)	4 to 8 psi (.281 to .562kg/cm²) at 5000 RPM	

TIMING ADJUSTMENTS

1. Place engine in a test tank and connect fuel line. Pre-set idle mixture screw at 1½ turns (±¼ turn) out from seated position.
2. Install Timing Light (C-91-35507) by connecting red lead to No. 1 (top) spark plug and connecting black leads to battery positive (+) and negative (-) posts.
3. Start engine and place shift lever in forward gear.



a - Maximum Spark Advance Screw
b - Locknuts
c - Idle Mixture Screw
d - Idle RPM Screw

Figure 1. Maximum Spark Advance Adjustment

4. Advance twist grip until timing line on flywheel aligns with maximum timing mark (see specification above) on starter housing. Adjust maximum advance screw (Figure 1) until end of screw just touches throttle lever. Tighten jam nut.
5. Close throttle with twist grip. Shut engine off and remove Timing Light.

CARBURETOR ADJUSTMENT

1. Restart engine and adjust idle mixture for "best idle" in forward gear. See carburetor adjustment information, preceding.
2. Set idle RPM to specification in forward gear.

MAXIMUM NEUTRAL RPM LIMITER ADJUSTMENT

1. With engine running in neutral, loosen neutral RPM limiter screw. (Figure 2) Move limiter toward rear of engine and tighten screw only enough to place light tension on limiter.
2. Turn twist grip to attain 2400-2700 RPM, then tighten limiter screw securely. Recheck RPM by returning to idle, then open throttle against limiter. Readjust limiter if necessary.
3. Check that neutral RPM limiter does not interfere with throttle operation in forward gear. If limiter interferes, move its back edge toward cylinder block, then recheck neutral RPM.

NOTE: This adjustment MUST BE accurate to assure easy starting when engine is cold.

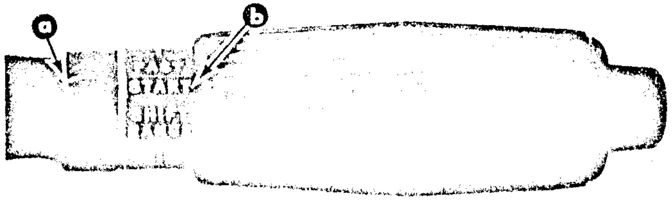


a - Neutral RPM Limiter
b - Adjustment Screw

Figure 2. Neutral RPM Limiter Adjustment

TILLER HANDLE DECAL PLACEMENT

1. With engine in neutral and twist grip turned against neutral RPM limiter, "Start" on twist grip decal must align with arrow on tiller handle. (Figure 3)

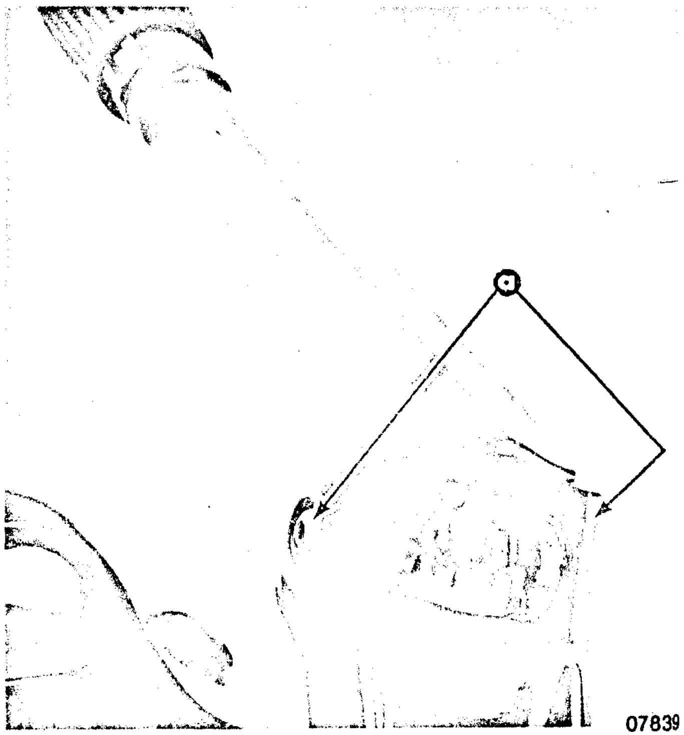


07822

a - Arrow   b - "Start"

Figure 3. Tiller Handle and Decal Alignment

2. Reposition twist grip, if necessary, by removing 2 allen head screws at tiller handle knuckle (Figure 4) and realign gears, as necessary, to align "Start" with arrow. Reinstall allen screws.



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a - Allen Head Screws

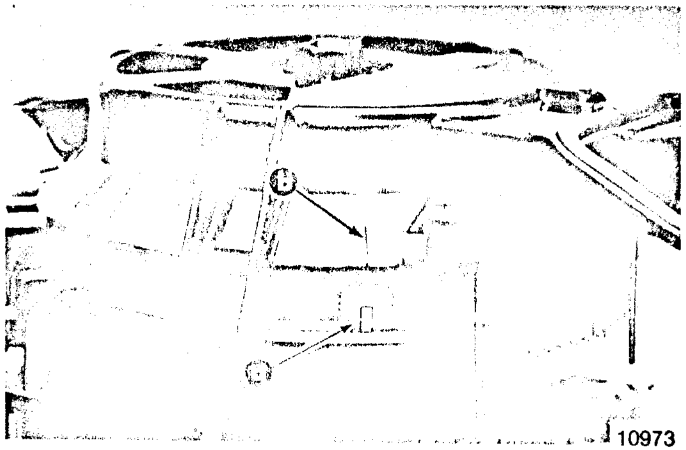
Figure 4. Tiller Handle Gear Realignment

TIMING/SYNCH./ADJUSTING Merc 75 (Above Serial No. 4397537) and Merc 110 (Above Serial No. 4387437)

Firing Order	Alternate Firing
Spark Plug	AC-V40FFK or Champion L78V
Spark Plug Gap	Not Adjustable
Timing Maximum Advance	Align Timing Marks
Throttle Pickup	Not Adjustable
Full Throttle RPM	4500-5500 RPM
Idle RPM	650-750 RPM in Gear
Water Pressure (at Tell-Tale)	4 to 8 psi (.281 to .562kg/cm²) at 5000 RPM

TIMING ADJUSTMENTS

1. Place engine in a test tank and connect fuel line.
2. Pre-set carburetor idle mixture screw 1½ turns out from lightly seated position.
3. Connect Timing Light (C-91-35507) to No. 1 (top) spark plug.

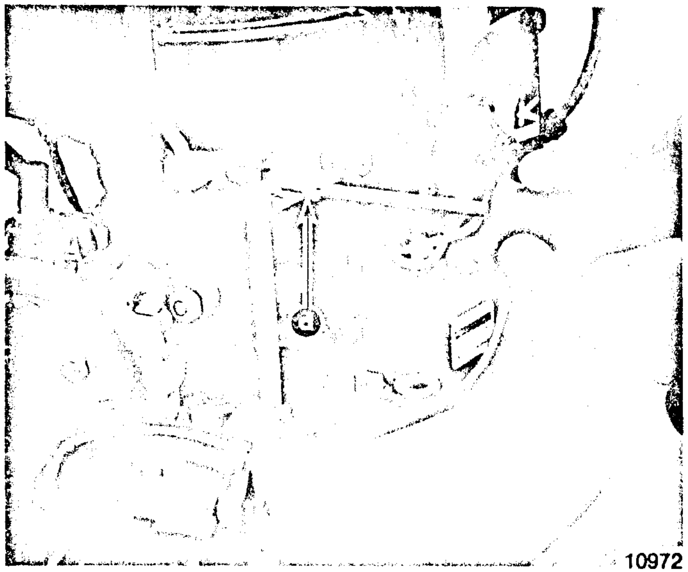


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a - Maximum Timing Mark (on Flywheel)
b - Timing Alignment Mark

Figure 1. Maximum Spark Advance Timing Marks Aligned

4. Start engine and shift into forward gear. Advance engine RPM until maximum timing mark on flywheel is aligned with timing alignment mark on starter housing, as shown in Figure 1. Adjust maximum spark advance screw (Figure 2) so that end of screw just touches throttle lever. Retighten nut on adjustment screw. Return throttle back to idle and turn off engine. Disconnect timing light.

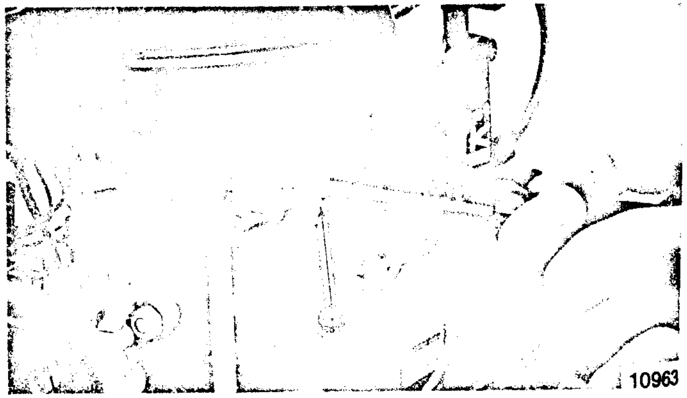


a - Maximum Spark Advance Screw

Figure 2. Maximum Spark Advance Adjustment

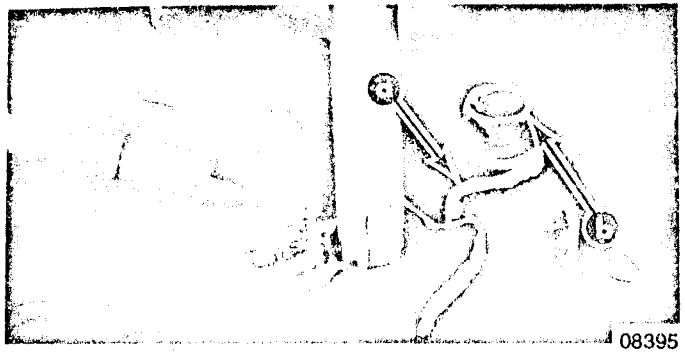
CARBURETOR ADJUSTMENT

1. Start engine and allow to warm up to normal operating temperature.
2. With engine running in forward gear, adjust carburetor idle mixture screw to attain "best idle" in forward gear. Refer to carburetor adjustment information, preceding.
3. Adjust engine idle RPM to specifications with engine running in forward gear. (Figure 3) Retighten nut on adjustment screw.



a - Idle RPM Screw

Figure 3. Idle RPM Adjustment



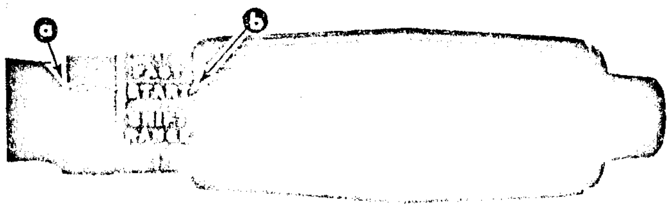
a - Maximum Neutral Speed Stop b - Bolt

Figure 4. Maximum Neutral Speed Limiter Adjustment Only on Engines with a Tiller (Twist Grip) Handle

MAXIMUM NEUTRAL RPM LIMITER ADJUSTMENT

IMPORTANT: Maximum neutral speed limiter adjustment stops the rotation of tiller handle-twist grip when throttle is at specified maximum neutral speed. This adjustment must be accurate to assure easy starting when engine is cold and prevent engine from starting at maximum RPM.

1. With engine idling in neutral, loosen bolt (Figure 4) just enough to enable maximum neutral speed stop (Figure 4) to slide back-and-forth, then turn twist grip (advance engine RPM) to 2400-2700 RPM. Without turning twist grip, position and secure maximum neutral speed stop against neutral speed limiter follower. (Figure 5) This will stop throttle at maximum neutral speed. Recheck adjustment to see if maximum neutral speed stop stops the throttle at 2400-2700 RPM. Readjust if necessary.
2. Shift engine into forward and check that neutral speed stop does not interfere with throttle operation in forward gear. If stop interferes, move back edge of stop toward cylinder block.



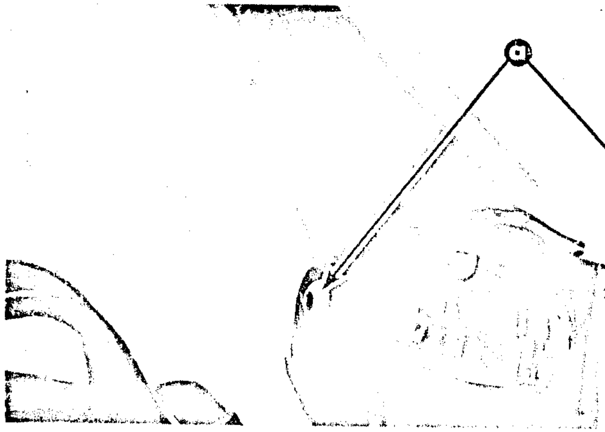
a - Arrow b - "Start"

Figure 4. Throttle Handle and Throttle Decal Alignment

TILLER HANDLE and THROTTLE DECAL ALIGNMENT

1. With engine not running, shift into neutral position and turn twist grip until throttle is against maximum neutral stop. The word, "Start", on throttle decal must be aligned with arrow on tiller handle, as shown in Figure 4. If "Start" does not align with arrow, refer to steps, following:

a. Remove (and retain) 2 screws (Figure 5) which secure tiller handle to engine.
b. Realign gears (Figure 5), as necessary, to align "Start" with arrow.
c. Reinstall tiller handle to engine with 2 screws. Tighten screws securely.



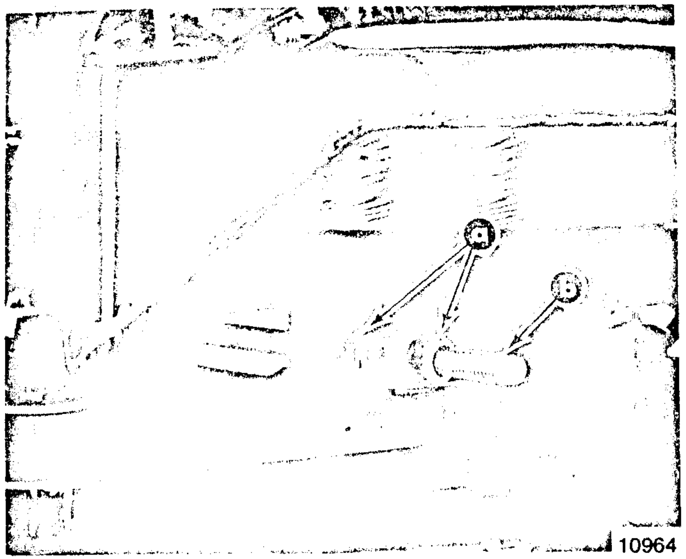
a - Allen Head Screws (One Hidden)

Figure 5. Tiller Handle Gear Realignment

TIMING/SYNCH./ADJUSTING Merc 200 (All Models, except Electric Models, Serial No. 4709593 and Above)

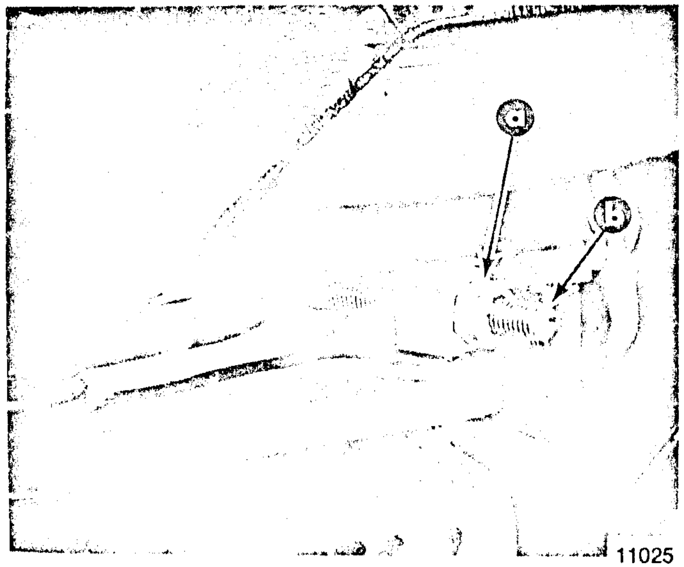
Firing Order	Alternate Firing
Spark Plug	AC-V40FFK or Champion L78V
Spark Plug Gap	Not Adjustable
Timing Maximum Advance	33° BTDC @ 5000 RPM
Throttle Pickup	Below Serial No. 4102790 - 2° BTDC to 2° ATDC; Above Serial No. 4102789 - 3° to 7° BTDC
Full Throttle RPM	4800-5500 RPM
Idle RPM	550-650 in Gear (Approx. 10° ATDC)
Water Pressure (at Tell-Tale)	6 to 8 psi (.422 to .562kg/cm²) at 5000 RPM

1. Place engine in test tank and connect fuel line.
2. Pre-set carburetor idle mixture screw at 1½ turns out from lightly seated position.
3. Connect Timing Light to No. 1 (top) spark plug.



a - Elastic Stop Nuts (2) b - Link Rod

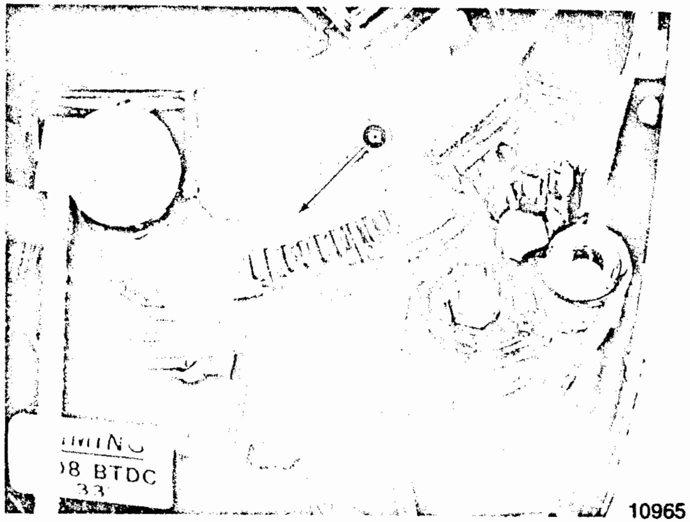
Figure 1. Maximum Spark Advance Adjustment (Model with Adjustable Elastic Stop Nuts)



a - Jam Nut b - Link Rod

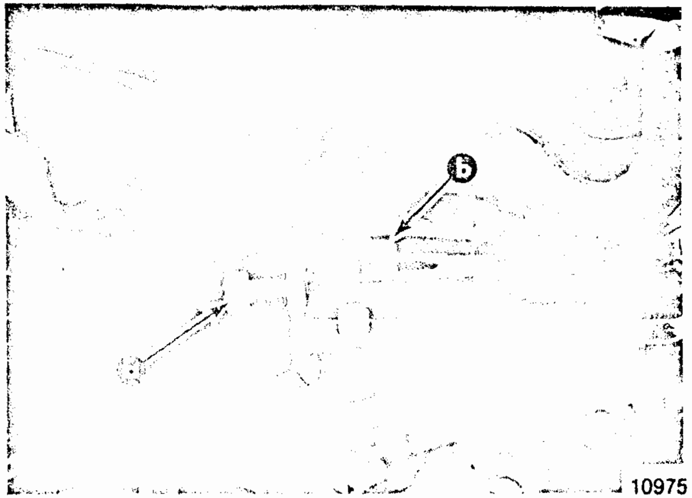
Figure 2. Maximum Spark Advance Adjustment (Model with Adjustable Link Rod)

4. Start engine and shift into forward gear. Advance throttle to full throttle RPM and adjust 2 elastic stop nuts (Figure 1) or adjust link rod (Figure 2), so that timing mark on flywheel is aligned with 33° BTDC mark on rewind starter housing, as shown in Figure 3. Retighten elastic stop nuts (Figure 1) or jam nut (Figure 2) and return throttle back to idle.



a - Timing Mark on Flywheel

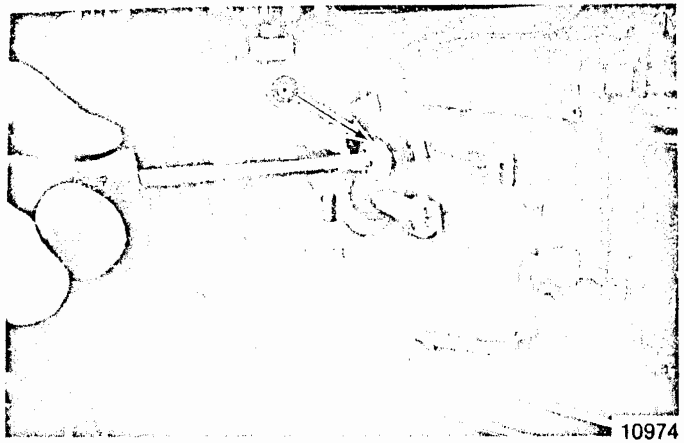
Figure 3. Timing Mark Alignment



a - Throttle Pickup Screw   b - Carburetor Cluster Pin

Figure 4. Throttle Pickup Adjustment

5. With engine running in forward gear, advance engine speed so that timing mark on flywheel is aligned with specified throttle pickup, then adjust throttle pickup screw (Figure 4) so that end of screw just touches carburetor cluster pin, as shown in Figure 4. Retighten nut on adjustment screw. Return engine speed back to idle, turn off engine and disconnect timing light.
6. With engine not running, move throttle arm to wide-open-throttle (WOT) and adjust full throttle stop screw (Figure 5) to allow full carburetor shutter opening at WOT. Make sure that carburetor shutter does not act as a throttle stop. Allow .010" to .015" (.25mm to .38mm) clearance between throttle pickup screw and carburetor cluster pin.

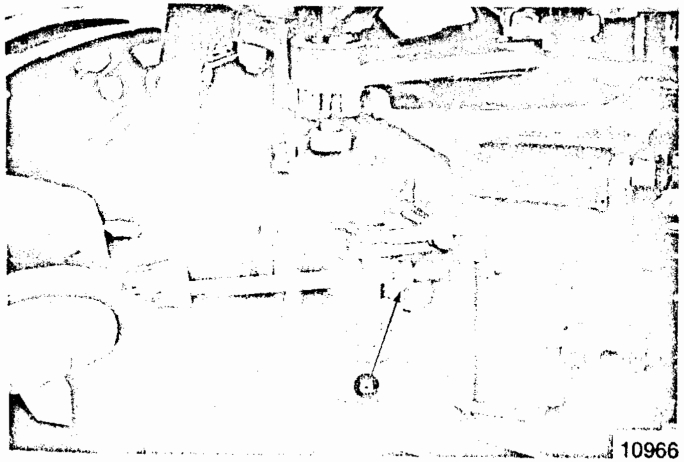


a - Full Throttle Stop Screw

Figure 5. Full Throttle Stop Adjustment

CARBURETOR ADJUSTMENT

1. Start engine and allow to warm up to normal operating temperature.
2. With engine running in forward gear, adjust carburetor idle mixture screw to attain "best idle" in forward gear. Refer to carburetor adjustment information, preceding.
3. Adjust idle RPM to specifications with engine running in forward gear. (Figure 6) Retighten nut on adjustment screw.



a - Idle RPM Screw

Figure 6. Idle RPM Adjustment

MAXIMUM NEUTRAL SPEED LIMITER ADJUSTMENT

IMPORTANT: Maximum neutral speed limiter adjustment stops the rotation of tiller handle-twist grip when throttle is at specified maximum neutral speed. This adjustment must be accurate to assure easy starting when engine is cold and prevent engine from starting at maximum RPM.

1. With engine idling in neutral, loosen bolt (Figure 7) just enough to enable maximum neutral speed stop (Figure 7) to slide back-and-forth, then turn twist grip (advance engine RPM to 2400-2700 RPM). Without turning twist grip, position and secure neutral speed stop against neutral speed limiter follower, as shown in Figure 7. This will stop throttle at maximum neutral speed. Recheck adjustment to see if maximum neutral speed stop stops the throttle at 2400-2700 RPM. Readjust if necessary.
2. Shift engine into forward and check that neutral speed stop does not interfere with throttle operation in forward gear. If stop interferes, move back edge of stop toward cylinder block.

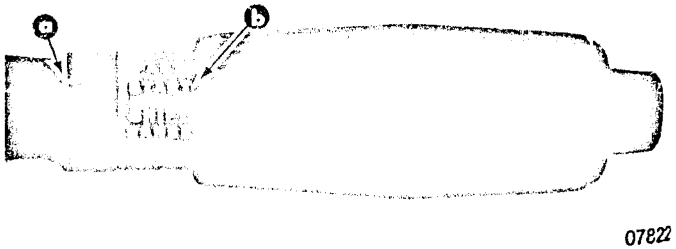


a - Maximum Neutral Speed Stop   b - Bolt

Figure 7. Neutral RPM Limiter Adjustment

TILLER HANDLE and THROTTLE DECAL ALIGNMENT

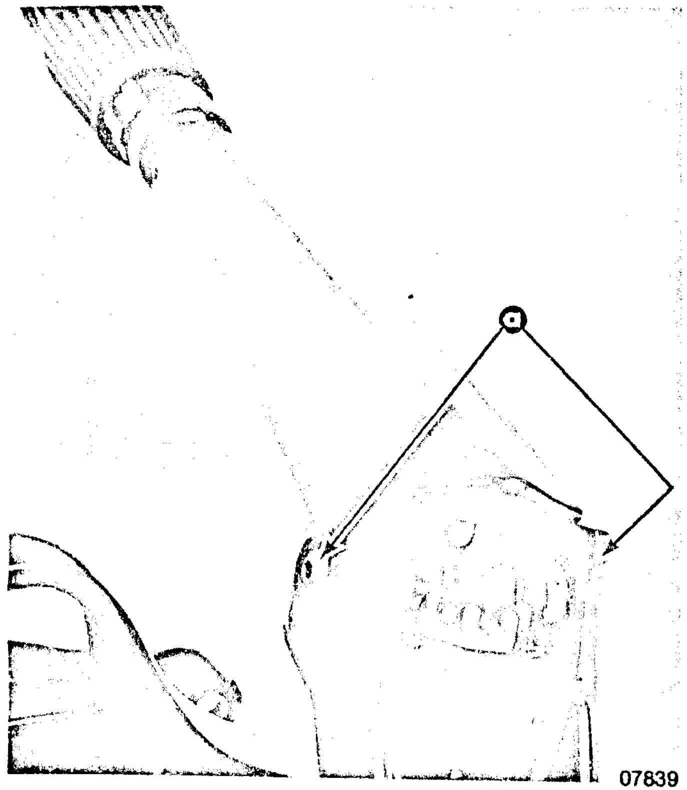
1. With engine not running, shift into neutral position and turn twist grip until throttle is against maximum neutral stop. The word, "Start", on throttle decal must be aligned with arrow on tiller handle, as shown in Figure 8. If "Start" does not align with arrow, refer to steps, following:



a - Arrow   b - "Start"

Figure 8. Throttle Handle and Throttle Decal Alignment

a. Remove (and retain) 2 screws (Figure 9) which secure tiller handle to engine.
b. Realign gears (Figure 9), as necessary, to align "Start" with arrow.
c. Reinstall tiller handle to engine with 2 screws. Tighten screws securely.



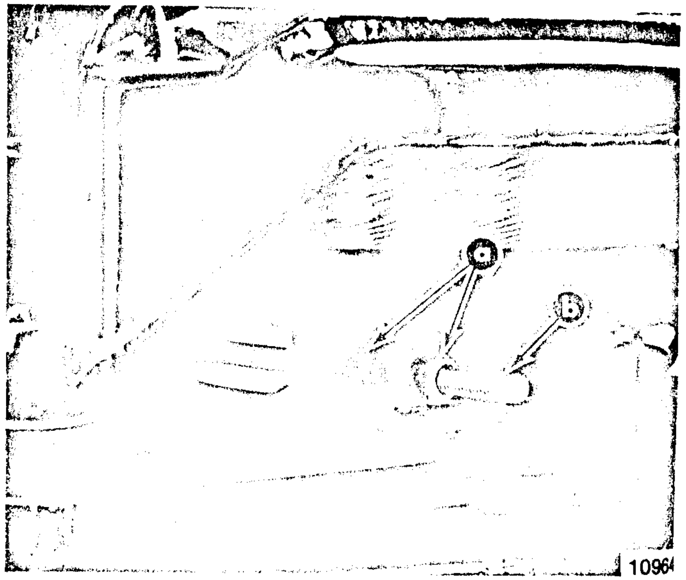
a - Allen Head Screws

Figure 9. Tiller Handle Gear Realignment

TIMING/SYNCH./ADJUSTING
Merc 200 Electric Model
(Serial No. 4709593 and Above)

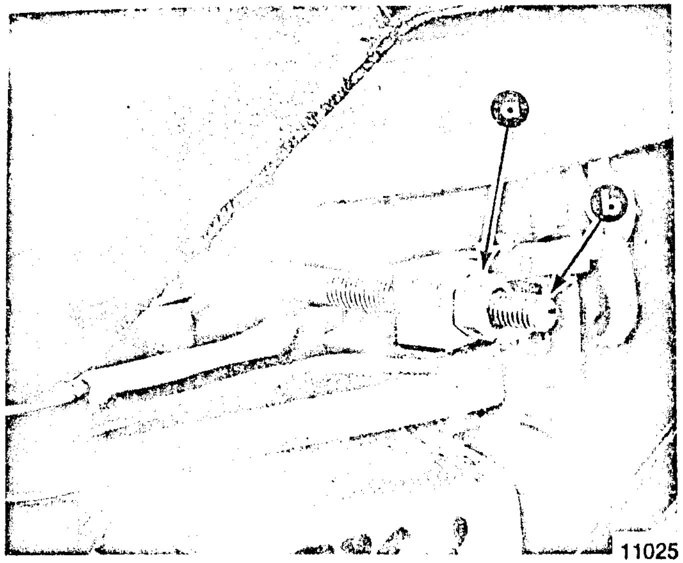
Firing Order	Alternate Firing
Spark Plug	AC-V40FFK or Champion L78V
Spark Plug Gap	Not Adjustable
Timing Maximum Advance	Align Interrupted Line with Timing Pointer
Throttle Pickup	Align Solid Line with Timing Pointer
Full Throttle RPM	4800-5500 RPM
Idle RPM	550-650 in Gear
Water Pressure (at Tell-Tale)	6 to 8 psi (.422 to .562kg/cm²) at 5000 RPM

1. Place engine in test tank and connect fuel line.
2. Pre-set carburetor idle mixture screw at 1½ turns out from lightly seated position.
3. Connect Timing Light to No. 1 (top) spark plug.



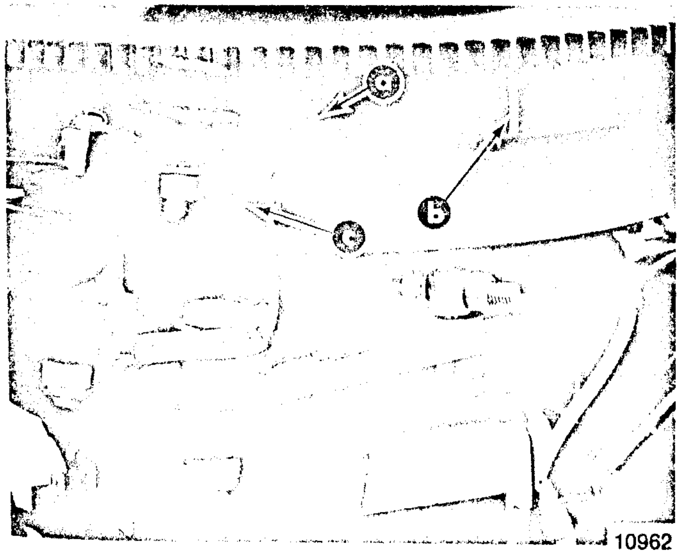
a - Elastic Stop Nuts (2)　　b - Link Rod

Figure 1. Maximum Spark Advance Adjustment (Model with Adjustable Elastic Stop Nuts)



a - Jam Nut　　b - Link Rod

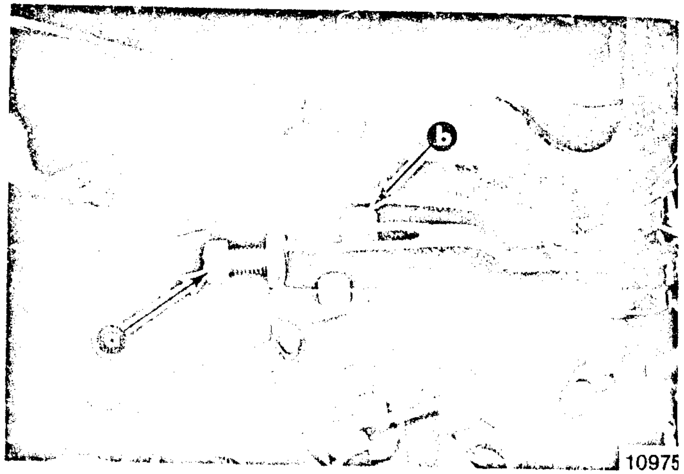
Figure 2. Maximum Spark Advance Adjustment (Model with Adjustable Link Rod)



a - Maximum Spark Advance Timing Mark
b - Throttle Pickup Timing Mark
c - Timing Pointer

Figure 3. Timing Mark Alignment

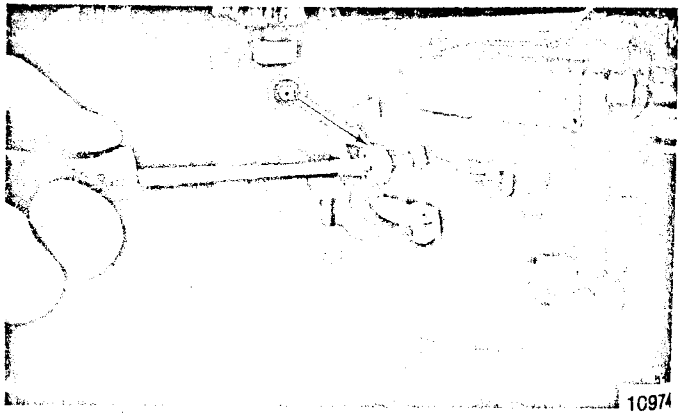
4. Start engine and shift into forward gear. Advance throttle to full throttle RPM and adjust 2 elastic stop nuts (Figure 1), or adjust link rod (Figure 2) so that timing pointer is aligned with maximum spark advance mark (interrupted line) on flywheel. (Figure 3) Retighten elastic stop nuts (Figure 1) or jam nut (Figure 2) and return throttle back to idle.



a - Throttle Pickup Screw b - Carburetor Cluster Pin

Figure 4. Throttle Pickup Adjustment

5. With engine running in forward gear, advance engine speed so that timing pointer is aligned with throttle pickup mark (solid line) on flywheel (Figure 1), then adjust throttle pickup screw (Figure 4) so that end of screw just touches carburetor cluster pin, as shown in Figure 4. Retighten nut on adjustment screw. Return engine speed back to idle, turn off engine and disconnect timing light.
6. With engine not running, move throttle lever to wide-open-throttle (WOT) and adjust full throttle stop screw (Figure 5) to allow full carburetor shutter opening at WOT. Make sure that carburetor shutter does not act as a throttle stop. Allow .010" to .015" (.25mm to .38mm) clearance between throttle pickup screw and carburetor cluster pin.

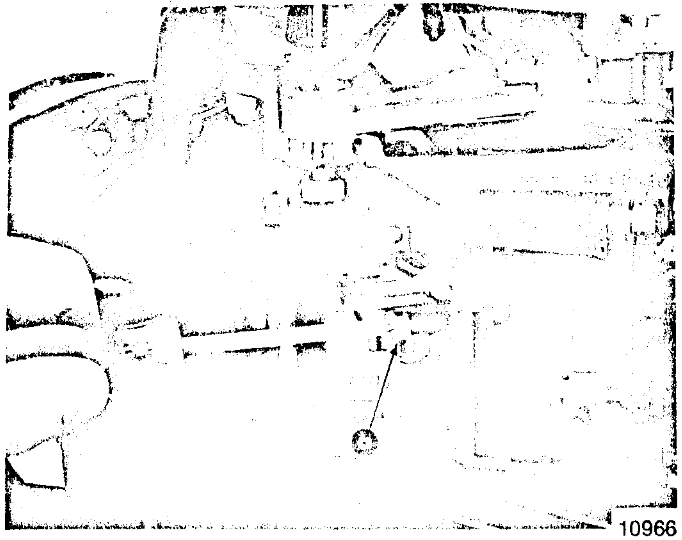


a - Full Throttle Stop Screw

Figure 5. Full Throttle Stop Screw Adjustment

CARBURETOR ADJUSTMENT

1. Start engine and allow to warm up to normal operating temperature.
2. With engine running in forward gear, adjust carburetor idle mixture screw to attain "best idle" in forward gear. Refer to carburetor adjustment information, preceding.
3. Adjust idle RPM to specifications with engine running in forward gear (Figure 6) Retighten nut on adjustment screw.

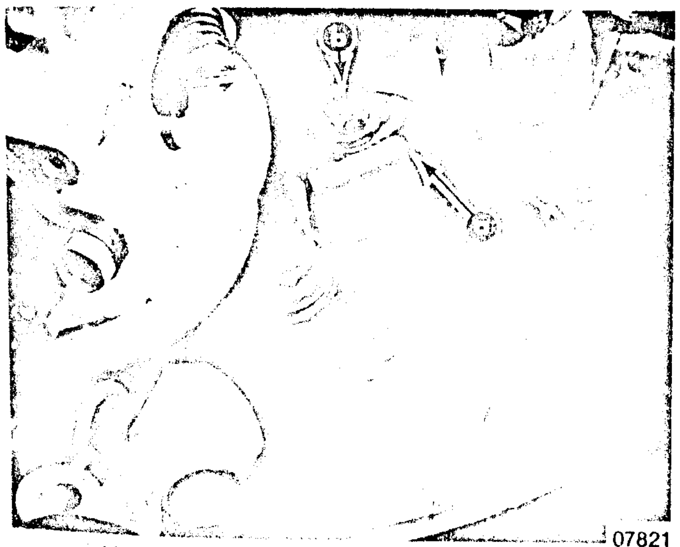


a - Idle RPM Screw

Figure 6. Idle RPM Adjustment

MAXIMUM NEUTRAL SPEED LIMITER ADJUSTMENT [for Models with Tiller (Twist Grip) Handle]

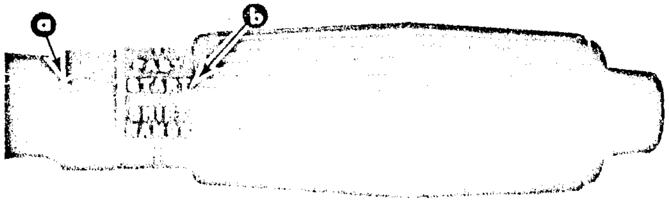
IMPORTANT: Maximum neutral speed limiter adjustment stops the rotation of tiller handle-twist grip when throttle is at specified maximum neutral speed. This adjustment must be accurate to assure easy starting when engine is cold and prevent engine from starting at maximum RPM.



a - Maximum Neutral Speed Stop b - Bolt

Figure 7. Maximum Neutral Speed Limiter Adjustment (for Models with Tiller Handle)

1. With engine idling in neutral, loosen bolt (Figure 7) just enough to enable maximum neutral speed stop (Figure 7) to slide back-and-forth, then turn twist grip (advance engine RPM to 2400-2700 RPM). Without turning twist grip, position and secure neutral speed stop against neutral speed limiter, as shown in Figure 7. This will stop throttle at maximum neutral speed. Recheck adjustment to see if maximum neutral speed stop stops the throttle at 2400-2700 RPM. Readjust if necessary.
2. Shift engine into forward and check that neutral speed stop does not interfere with throttle operation in forward gear. If stop interferes, move back edge of stop toward cylinder block.



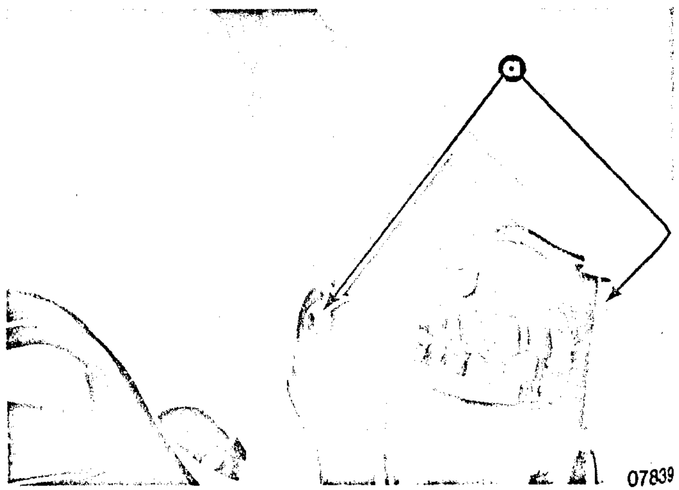
07822

a - Arrow b - "Start"

Figure 8. Throttle Handle and Throttle Decal Alignment (for Models with Tiller Handle)

TILLER HANDLE and THROTTLE DECAL ALIGNMENT

1. With engine not running, shift into neutral position and turn twist grip until throttle is against maximum neutral stop. The word, "Start", on throttle decal must be aligned with arrow on tiller handle, as shown in Figure 8. If "Start" does not align with arrow, refer to steps, following:
   a. Remove (and retain) 2 screws (Figure 9) which secure tiller handle to engine.
   b. Realign gears (Figure 9), as necessary, to align "Start" with arrow.
   c. Reinstall tiller handle to engine with 2 screws. Tighten screws securely.



07839

a - Allen Head Screws

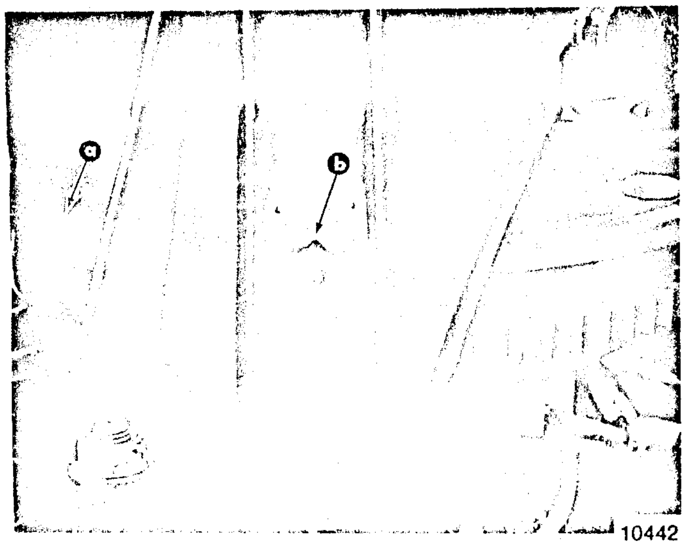
Figure 9. Tiller Handle Gear Realignment (for Models with Tiller Handle)

TIMING/SYNCH./ADJUSTING

Merc 402

Firing Order	Alternate Firing
Spark Plug	AC-V40FFM or Champion L76V
Spark Plug Gap	Not Adjustable
Timing Maximum Advance	Align Notch with Solid Line on Flywheel
Throttle Primary Pickup	Align Notch with 2 Dots on Flywheel
Throttle Secondary Pickup	See Step 6
Full Throttle RPM	5000-5500 RPM
Idle RPM	550-650 RPM in Gear
Water Pressure (at Cylinder Block)	6 to 14 psi (.422 to .984kg/cm²) at 5200 RPM

IMPORTANT: When timing engine, use proper timing window, as shown in Figure 1.

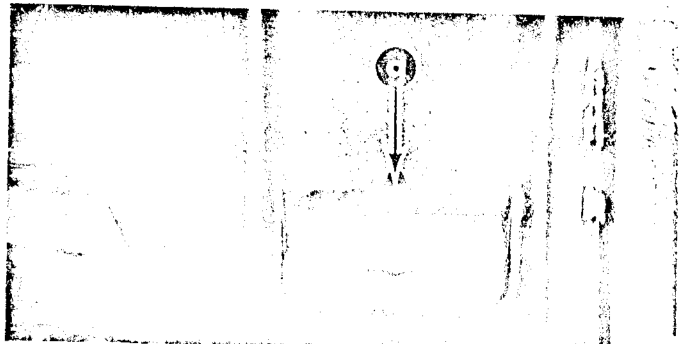


10442

a - Use This Timing Window on Merc 402's below Serial No. 4726798
b - Use This Timing Window on Merc 402's with Serial No. 4726798 and Above

Figure 1. Timing Location - Merc 402

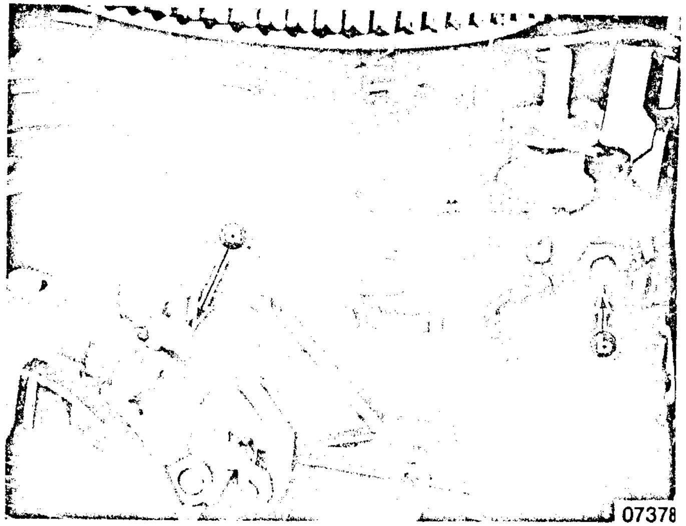
1. Place engine in test tank and connect fuel line.
2. Pre-set carburetor idle mixture screw at 1½ turns out from lightly seated position.
3. Connect Timing Light to No. 1 (top) spark plug.
4. Start engine and shift into forward gear. Advance engine RPM until timing mark (2 dots) are aligned with notch in timing window, as shown in Figure 2. Adjust turnbuckle so that throttle cam just touches the primary pickup arm on carburetor cluster. (Figure 3) Retighten turnbuckle locknuts and return engine speed back to idle.



07381

a - Timing Marks Aligned with Notch in Timing Window

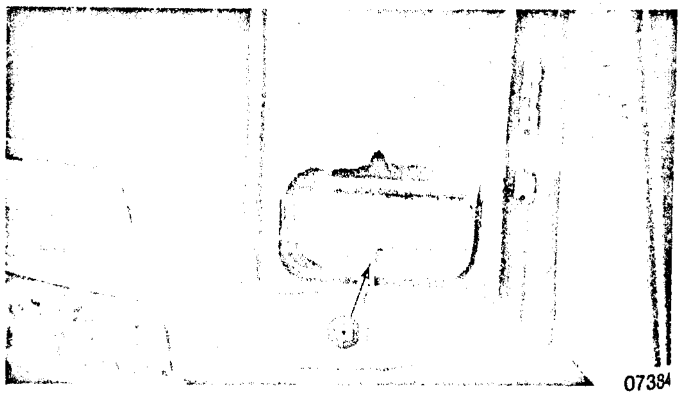
Figure 2. Throttle Pickup Timing Marks Aligned



07378

a - Just Touching b - Turnbuckle

Figure 3. Throttle Pickup Adjustment

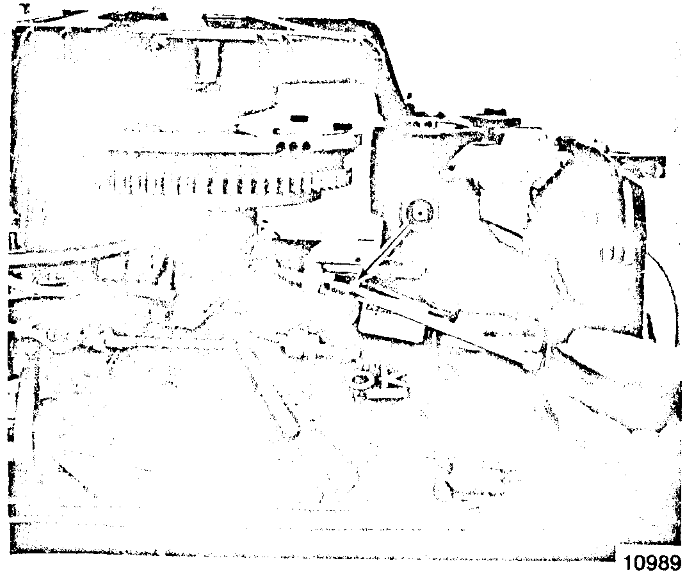


07384

a - Maximum Timing Mark Aligned with Notch in Timing Window

Figure 4. Maximum Timing Marks Aligned

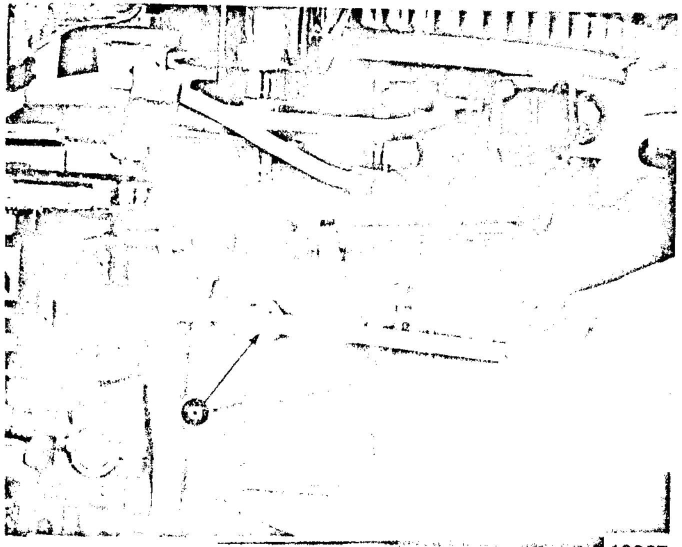
5. With engine running in forward gear, advance engine speed to full throttle 5000-5200 RPM. Adjust maximum spark advance screw (Figure 5) until timing mark (straight line) on flywheel is aligned with notch in timing window, as shown in Figure 4. Return engine speed back to idle and turn off engine. Disconnect timing light.



10989

a - Maximum Spark Advance Screw

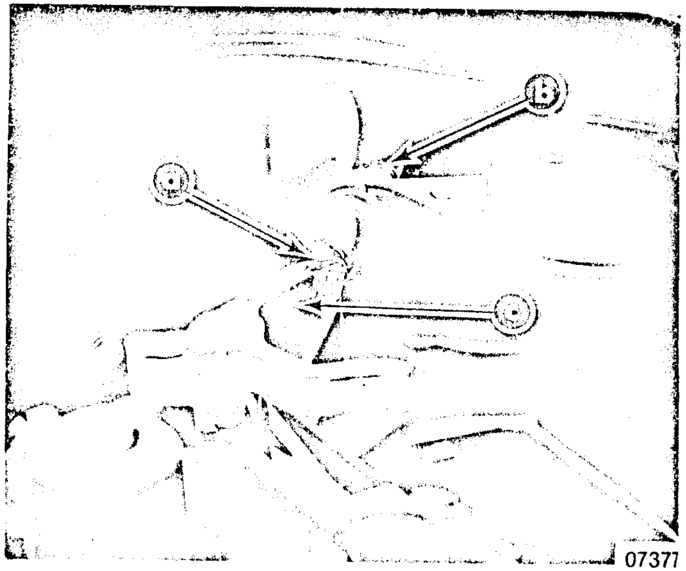
Figure 5. Maximum Spark Advance Adjustment



10987

a - Secondary Pickup Screw

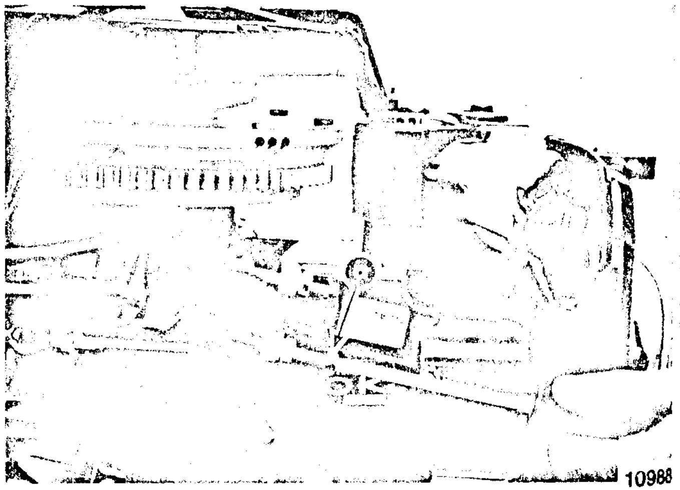
Figure 6. Secondary Pickup Screw Adjustment



a - Just Touching b - Secondary Throttle Pickup Screw
c - Secondary Cluster Arm

Figure 7. Adjusting Secondary Throttle Pickup

6. With engine not running, position spark advance lever against maximum spark stop. DO NOT actuate throttle lever. Adjust secondary throttle pick-up screw (Figure 6) so that end of screw just touches secondary pickup arm on carburetor cluster, as shown in Figure 7. Retighten nut on adjustment screw.
7. With engine not running, move throttle lever to wide-open-throttle (WOT) and adjust throttle stop screw (Figure 8) to allow full carburetor shutter opening at WOT. Make sure that carburetor shutter does not act as a throttle stop. Allow .010" to .015" (.25mm to .38mm) clearance between secondary pickup screw and secondary pickup arm on carburetor cluster.



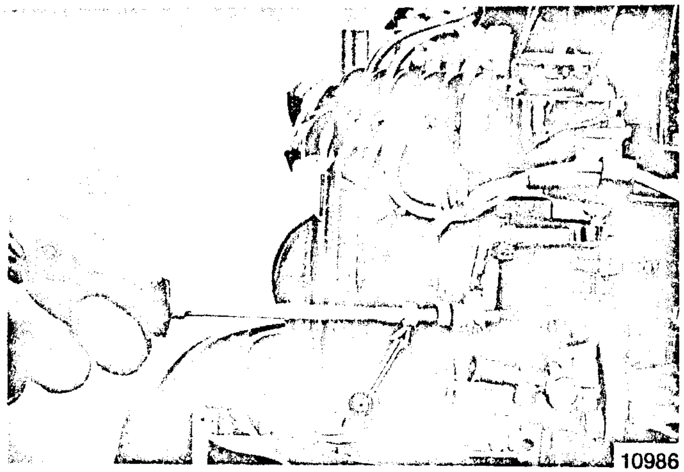
a - Full Throttle Stop Screw

Figure 8. Full Throttle Stop Adjustment

CARBURETOR ADJUSTMENTS

1. Start engine and allow it to warm up in forward gear.
2. Adjust carburetor idle mixture screw to attain best idle in forward gear. See carburetor adjustment information, preceding.
3. Adjust engine idle RPM as follows:
   a. With engine in water, connect electrical harness and fuel line to engine. Start engine and allow to warm up.
   b. With throttle cable barrel removed from barrel retainer, adjust idle RPM to 500-650 RPM with engine running in forward gear. (Figure 9) Retighten nut on adjustment screw.
   c. With end of throttle cable connected to throttle lever, hold throttle lever against idle stop. Adjust throttle cable barrel to slip into barrel retainer on cable anchor bracket with a very light preload of throttle lever against idle stop. Lock barrel in place.
   d. Check preload on throttle cable by placing a thin piece of paper between idle stop screw and idle stop. Preload is correct when paper can be removed without tearing but has some drag on it. Readjust cable barrel, if necessary.

IMPORTANT: Excessive preload on throttle cable will cause difficulty when shifting from forward to neutral. (Readjust throttle cable barrel, if necessary.)



a - Idle RPM Screw

Figure 9. Idle RPM Adjustment

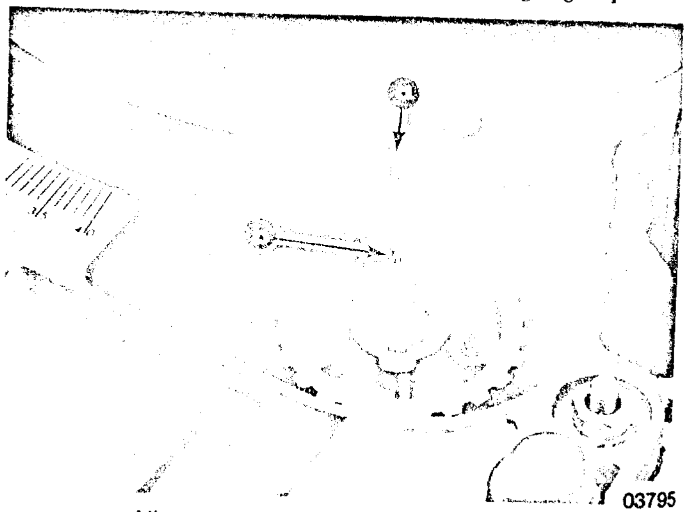
TIMING/SYNCH./ADJUSTING
Merc 500 (1975) with Lightning Energizer Ignition System

Firing Order	1-3-2-4
Firing Sequence	90° Consecutive
Spark Plug	AC-V40FFM or Champion L76V
Spark Plug Gap	Not Adjustable
Timing Maximum Advance	35° BTDC @ 5200 RPM
Throttle Primary Pickup	7°-9° BTDC
Throttle Secondary Pickup	At 35° BTDC Stop
Full Throttle RPM	4800-5500 RPM
Idle RPM	550-600 (3°-5° ATDC) in Forward Gear
Water Pressure (at Cylinder Block)	3 to 5 psi (.211 to .352kg/cm²) @ 2000 RPM

DISTRIBUTOR DRIVE BELT INSTALLATION

1. Rotate flywheel until "Alignment Mark" (straight line on flywheel rim) is aligned with center of distributor shaft. (Figure 1)
2. Rotate distributor pulley until arrow (cast into pulley) is pointing at flywheel alignment mark. Slip drive belt over pulley and install pulley cover, washers and bolt. Torque cover bolt to 60 in. lbs. (69kg-cm). (Figure 1)

NOTE: When installing timing belt on 4 and 6-cylinder outboards with Thunderbolt Ignition, the arrow on the pulley may not align directly with the mark on the flywheel. If this should occur, align the arrow slightly clockwise (as viewed from front of outboard). This will appear to be approximately ½-tooth off. (Figure 2) Installing the belt ½-tooth to the left (counterclockwise) will make engine synchronization difficult and result in rough engine operation.



a - Alignment Mark   b - Arrow on Pulley

Figure 1. Distributor Drive Belt Installation

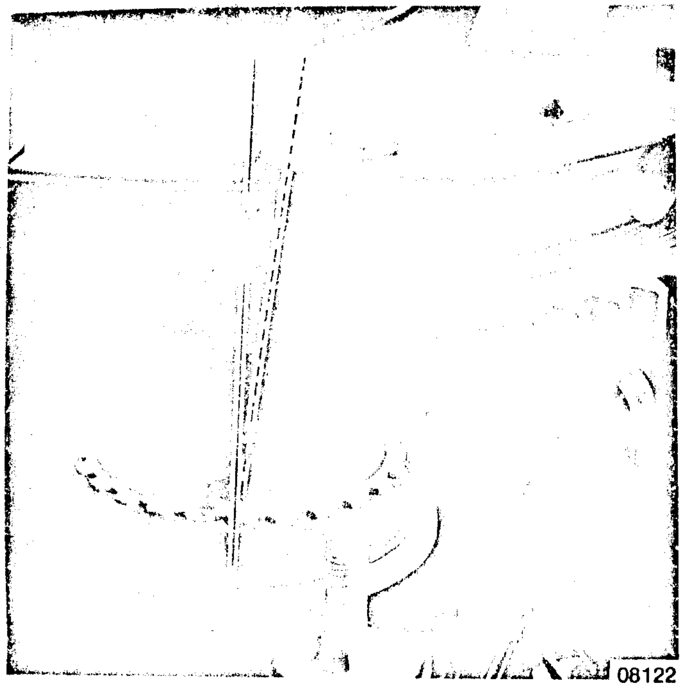
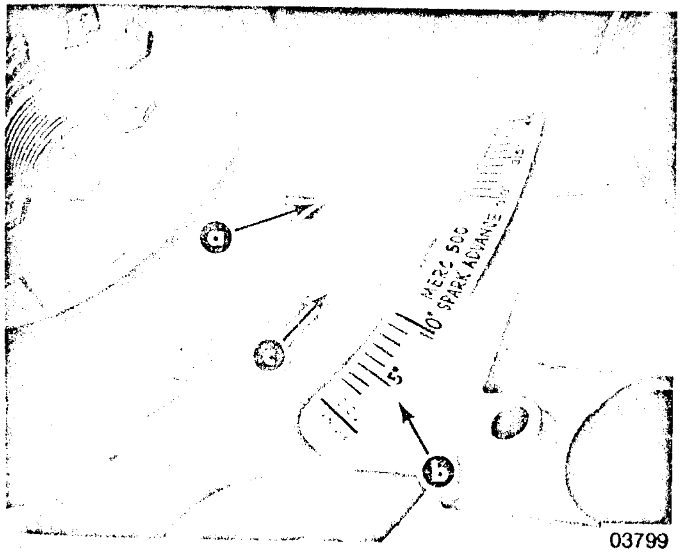


Figure 2. Alignment ½-Tooth Clockwise

TIMING ADJUSTMENTS

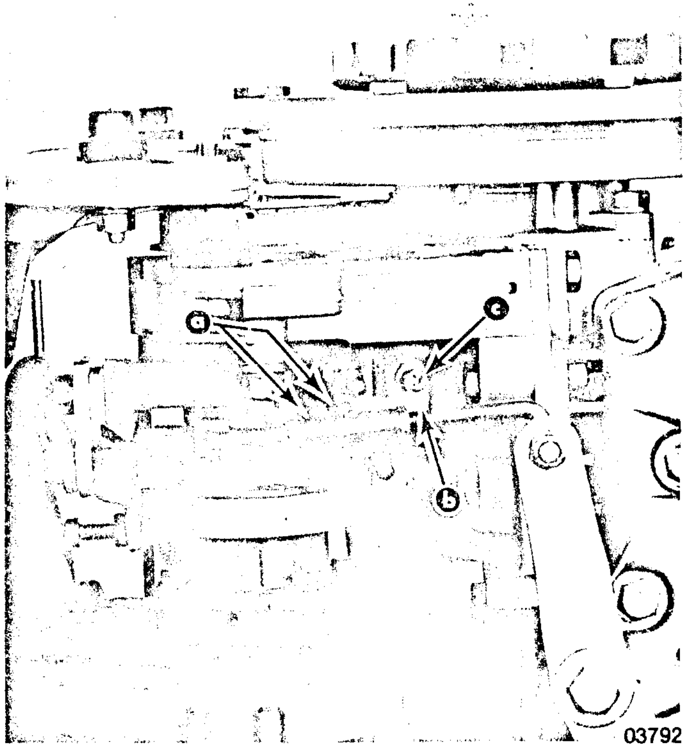
1. Place engine in a test tank and connect engine electrical harness and fuel line.
2. Pre-set carburetor idle mixture screws at 1¼ turn out from seated position.



a - Timing Light   b - Timing Decal   c - Timing Mark

Figure 3. Throttle Primary Pickup

3. Install Timing Light (C-91-35507) by connecting red lead to No. 1 (top) spark plug and connecting black leads to 12-volt battery positive (+) and negative (-) posts. Connect tachometer to engine.
4. With engine running in forward gear, open throttle to align timing mark (straight line on flywheel rim) with throttle primary pickup specification. (Figure 3)



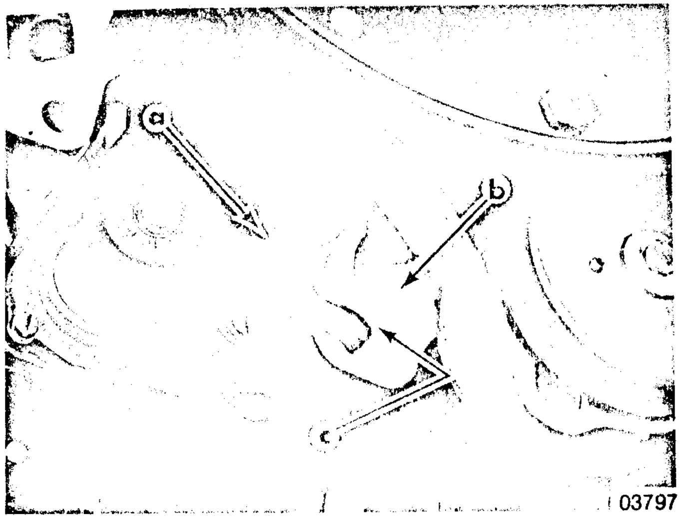
a - Screws   b - Throttle Actuator Plate
c - Throttle Secondary Pickup Screw

Figure 4. Throttle Actuator Plate Adjustment

5. With throttle positioned as in Step 4, loosen 2 actuator plate screws (Figure 4) and rotate actuator plate, as necessary, so that primary cam just touches primary pickup lever on carburetor cluster (Figure 5), then tighten screws.
6. Due to the electronic timing characteristics of this ignition, it is necessary to run the engine at wide-open-throttle (WOT) and to know the approximate RPM while adjusting the maximum spark advance. Refer to the chart, following, for maximum spark advance settings at differing RPM while at wide-open-throttle. Engine RPM will vary, depending upon propeller pitch and water level in test tank.

NOTE: The engine may be timed on a boat, but it must be timed at wide-open-throttle.

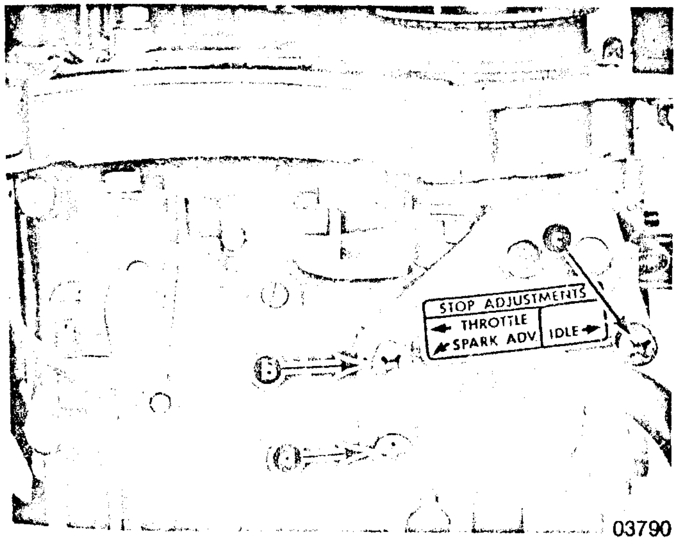
Engine RPM at Wide-Open-Throttle	Maximum Spark Advance Setting
2000-4000	38°-39° BTDC
4000-4800	37°-38° BTDC
5200-5500	35° BTDC



a - Carburetor Cluster   b - Actuator Plate   c - Just Touching

Figure 5. Throttle Primary Pickup Adjustment

7. With engine running in forward gear at WOT, determine engine RPM with tachometer. Use this RPM to select correct maximum spark advance from the preceding chart. With engine running in forward gear at WOT, adjust maximum spark stop screw to align timing mark on flywheel rim with corresponding degree mark on timing decal. Tighten locknut. (Figure 6)
8. Close throttle to idle position. Shut engine off and remove Timing Light.
9. With distributor adaptor held against maximum spark stop screw (but not actuating economizer collar spring), adjust throttle secondary pickup screw (Figure 4) to just touch secondary pickup arm on carburetor cluster. (Figure 7) Tighten locknut.



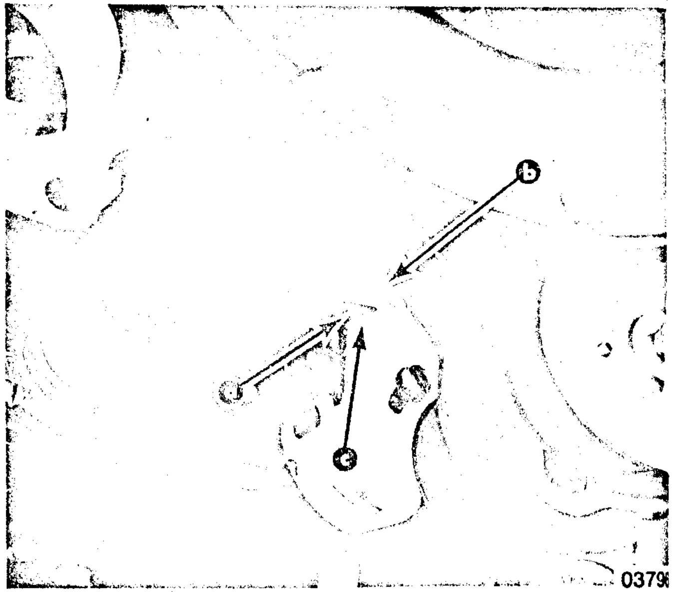
a - Maximum Spark Stop Screw   b - Full Throttle Stop Screw
c - Idle RPM Screw

Figure 6. Stop Screw Locations

10. Rotate throttle to WOT position and adjust throttle stop screw (Figure 5 to allow full carburetor opening, but not to allow throttle shutters to act a a stop or the carburetor cluster to hit carburetor filter cover.

CARBURETOR ADJUSTMENTS

1. Start engine and adjust idle mixture screw for best idle in forward gear. See carburetor adjustment information, preceding.
2. Set idle RPM within specifications while in forward gear.



a - Secondary Arm b - Secondary Pickup Screw
c - Just Touching

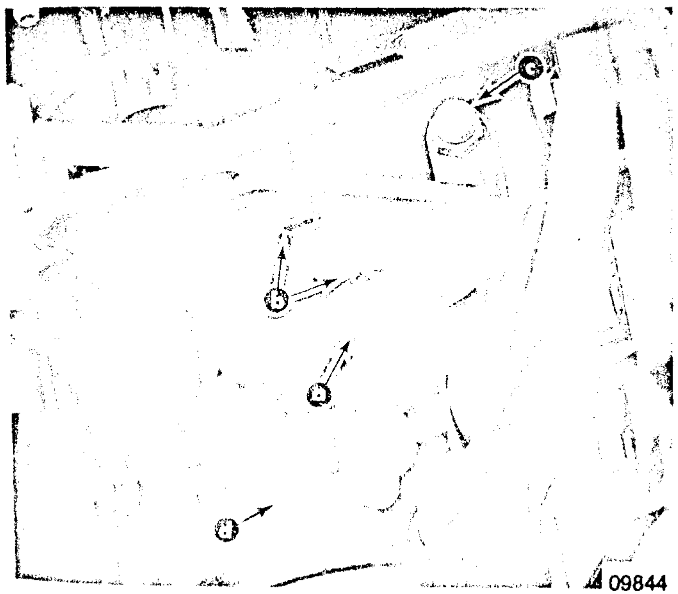
Figure 7. Throttle Secondary Pickup

TIMING/SYNCH./ADJUSTING Merc 500 (Up to Serial No. 4576236) with Distributor-Less Ignition System

Firing Order	1-3-2-4
Firing Sequence	90° Consecutive
Spark Plug	AC-V40FFM or Champion L76V
Spark Plug Gap	Not Adjustable
Timing Maximum Advance	30° @ 5000 RPM
Throttle Primary Pickup	7°-9° BTDC
Throttle Secondary Pickup	At 30° (Maximum) Stop
Full Throttle RPM	4800-5500 RPM
Idle RPM	550-600 RPM (5° ATDC)
Water Pressure (at Cylinder Block)	3 to 5 psi (.211 to .352kg/cm²) @ 2000 RPM

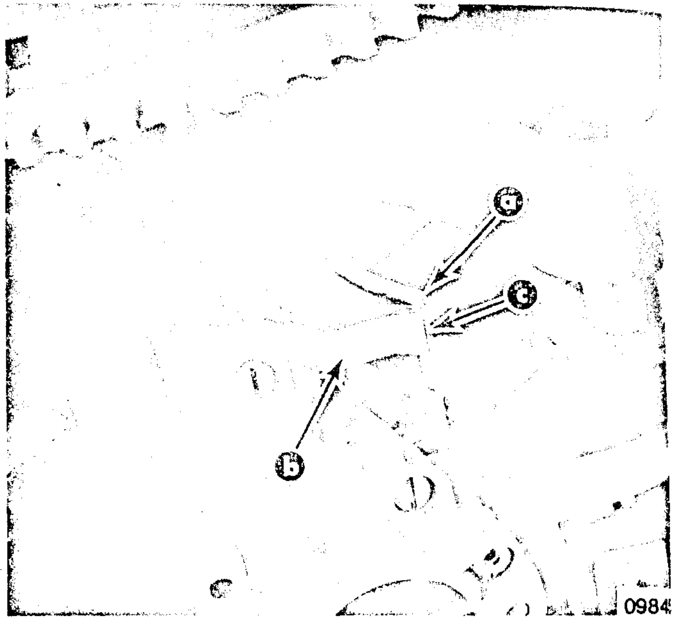
TIMING ADJUSTMENTS

1. Place engine in a test tank and connect engine electrical harness and fuel line.
2. Pre-set carburetor idle mixture screws at one turn out from seated position.
3. Connect Timing Light (C-91-35507) by connecting red lead to No. 1 (top) spark plug and connecting black leads to 12-volt battery positive (+) and negative (-) posts. Connect tachometer to engine.



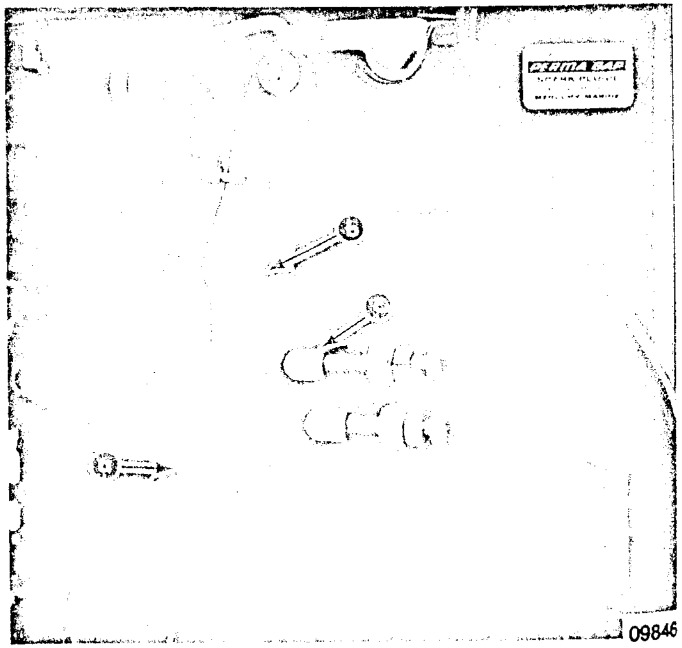
a - Actuator Plate c - Secondary Throttle Pickup Screw
b - Screws (2) d - Top Carburetor

Figure 1. Actuator Plate Screw Location



a - Actuator Plate Primary Cam
b - Carburetor Cluster Primary Lever
c - Just Touching

Figure 2. Primary Throttle Pickup Adjustment



a - Throttle Lever b - Spark Lever
c - Maximum Spark Stop Screw

Figure 3. Adjusting Maximum Spark Advance

[illegible] running in forward gear, move throttle arm to retard [illegible] RPM to approximately 550 to 600 RPM (5° ATDC). Adjust idle [illegible] against throttle arm and tighten locknut.
[illegible] throttle arm to align 7°-9° BTDC marks on flywheel decal with timing pointer. Loosen 2 throttle actuator plate retainer screws and rotate actuator plate so that the primary cam just touches primary pickup arm on carburetor cluster. (Figures 1 and 2) Tighten 2 retainer screws.

NOTE: Due to electronic timing characteristics of this ignition system, it is necessary to set the maximum spark advance at 32° BTDC, as described in Step 6, to attain 30° BTDC spark advance at 5000 RPM.

6. Advance throttle arm to align 32° BTDC mark on flywheel decal with timing pointer, adjust maximum spark stop screw to touch spark arm and tighten locknut. (Figure 3)



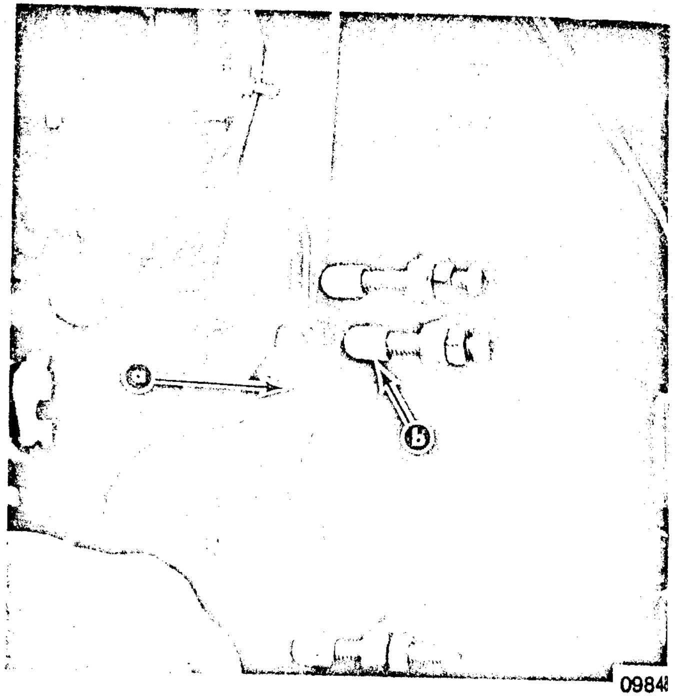
a - Actuator Plate Secondary Screw
b - Carburetor Cluster Secondary Lever
c - Just Touching

Figure 4. Secondary Throttle Pickup Adjustment

7. Stop engine. Advance throttle to position spark arm against spark stop screw and adjust actuator plate secondary pickup screw (Figure 1) to just touch secondary lever on carburetor cluster. (Figure 4) Tighten locknut.
8. Advance throttle arm to wide-open-throttle (WOT). Adjust full throttle stop screw to allow full carburetor shutter opening, but not to allow carburetor shutters to act as a stop. Allow .010" to .015" (.25mm to .38mm) clearance between secondary pickup screw and carburetor cluster secondary lever. (Figures 5 and 6)

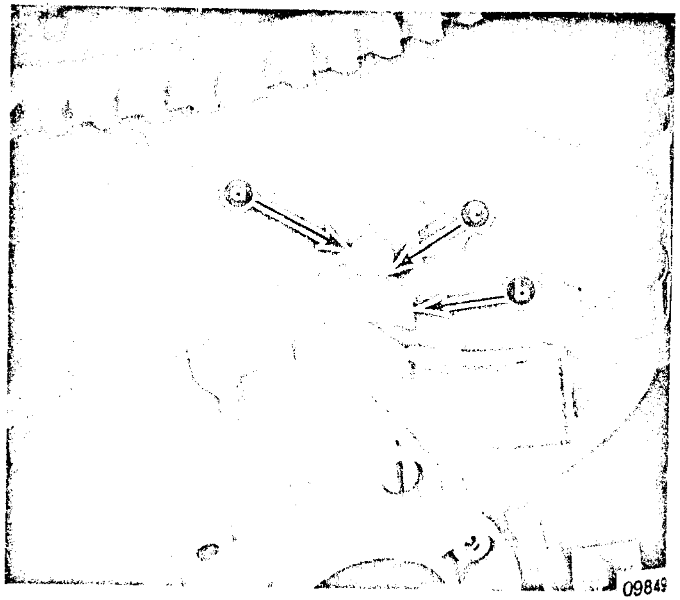
CARBURETOR ADJUSTMENTS

1. Start engine and adjust idle mixture screw for best idle in forward gear. See carburetor adjustment information, preceding.
2. Set idle RPM within specifications while in forward gear.



a - Throttle Lever b - Stop Screw

Figure 5. Throttle Lever against Full Throttle Stop



a - Secondary Pickup Screw
b - Carburetor Cluster Secondary Lever
c - .010" to .015" Clearance

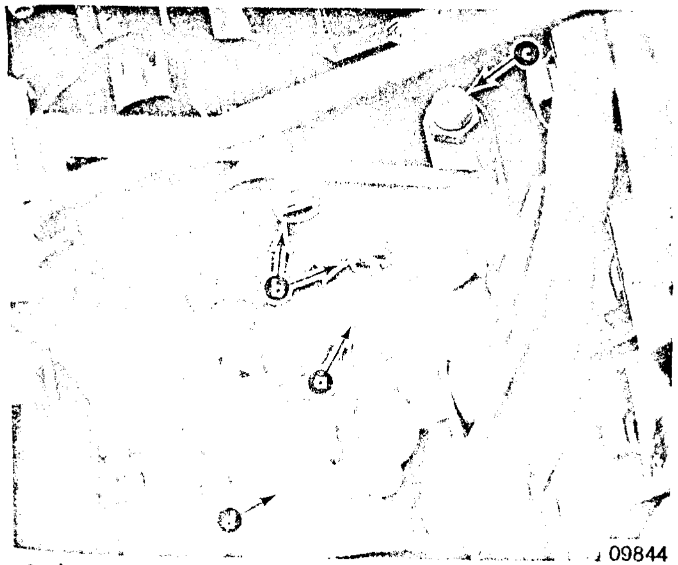
Figure 6. Throttle Stop Adjustment

TIMING/SYNCH./ADJUSTING Merc 500 (Serial No. 4576237 and Above)

Firing Order	1-3-2-4
Firing Sequence	90° Consecutive
Spark Plug	AC-V40FFK or Champion L78V
Spark Plug Gap	Not Adjustable
Timing Maximum Advance	30° @ 5000 RPM
Throttle Primary Pickup	7°-9° BTDC
Throttle Secondary Pickup	At 30° (Maximum) Stop
Full Throttle RPM	5000-5500 RPM
Idle RPM	550-600 RPM (5° ATDC)
Water Pressure (at Cylinder Block)	3 to 5 psi (.211 to .352kg/cm²) @ 2000 RPM

TIMING ADJUSTMENTS

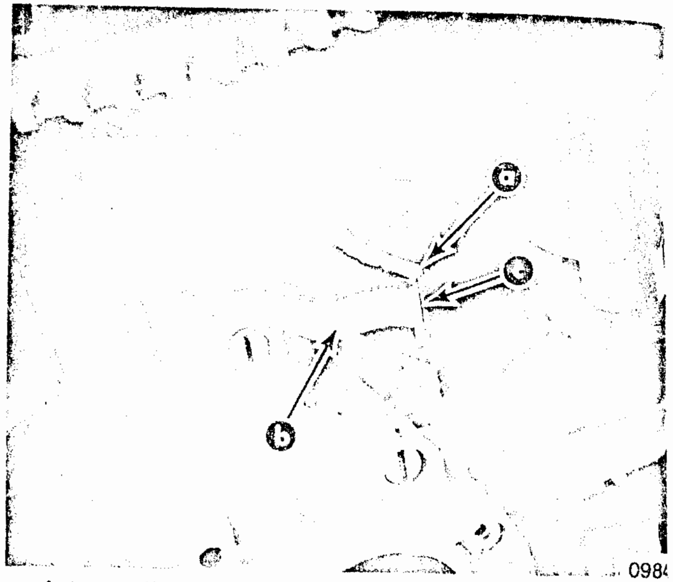
1. Place engine in a test tank or, if engine is mounted on boat, place boat and engine in water. Connect electrical harness and fuel line to engine.
2. Pre-set carburetor idle mixture screw at one turn out from lightly seated position.
3. Connect Timing Light to No. 1 (top) spark plug.



a - Actuator Plate
b - Screws (2)
c - Secondary Throttle Pickup Screw
d - Top Carburetor

Figure 1. Throttle Actuator Plate

4. With engine running in forward gear, advance engine speed until timing pointer is aligned with 7°-9° BTDC mark on timing decal, then loosen 2 throttle actuator plate retainer screws (Figure 1) and rotate actuator plate

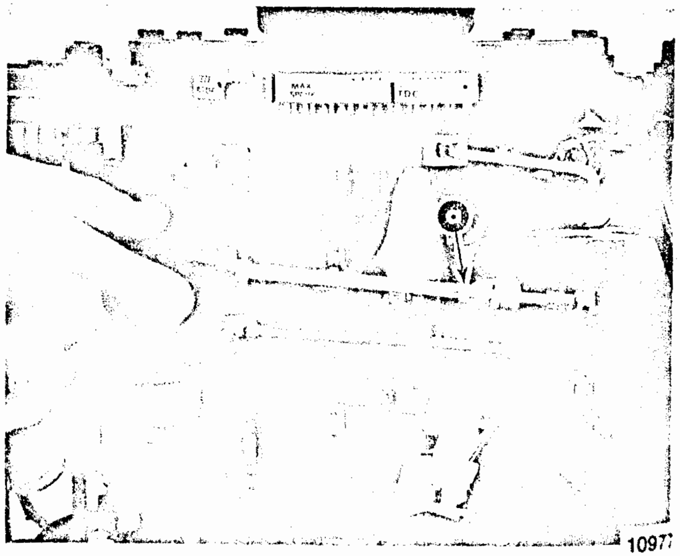


a - Actuator Plate Primary Cam
b - Carburetor Cluster Primary Leve
c - Just Touching

Figure 2. Primary Throttle Pickup Adjustment

so that the primary cam just touches primary pickup arm on carburetoı cluster, as shown in Figure 2. Retighten retainer screws and return engine speed back to idle.

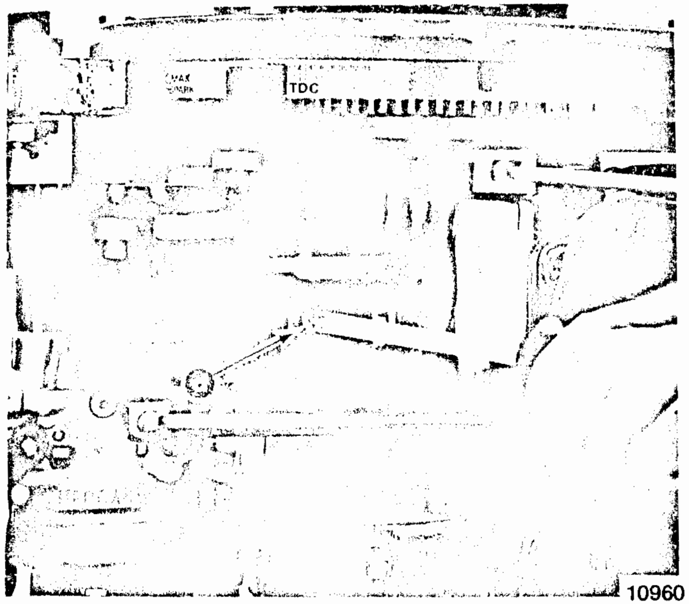
IMPORTANT: Electronic timing characteristics of this ignition system require that, when adjusting maximum spark advance, it is necessary to set the maximum spark advance at 32° BTDC to attain 30° BTDC spark advance.



a - Maximum Spark Advance Screw

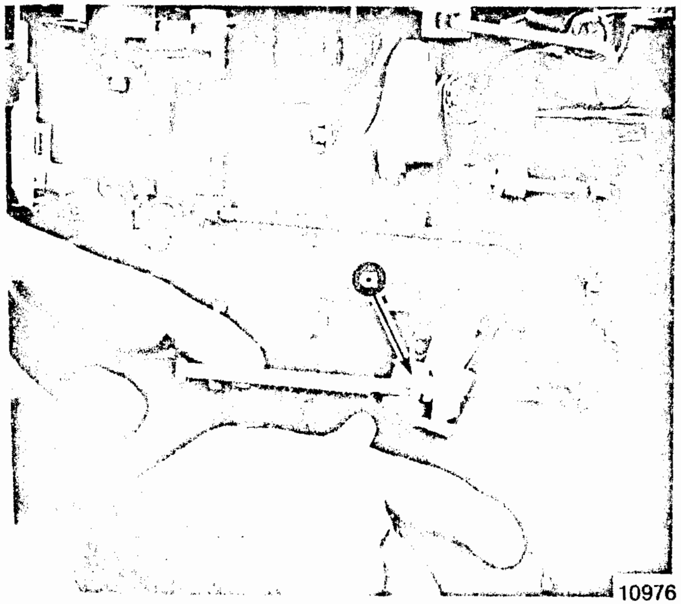
Figure 3. Maximum Spark Advance Adjustment

[illegible] in forward gear, advance engine speed until timing pointer aligns with 32° BTDC mark on timing decal. Adjust maximum spark stop screw so that end of screw touches spark lever, as shown in Figure 3. Retighten nut on adjustment screw, move throttle back to idle and turn off engine. Remove timing light.



a - Secondary Pickup Screw

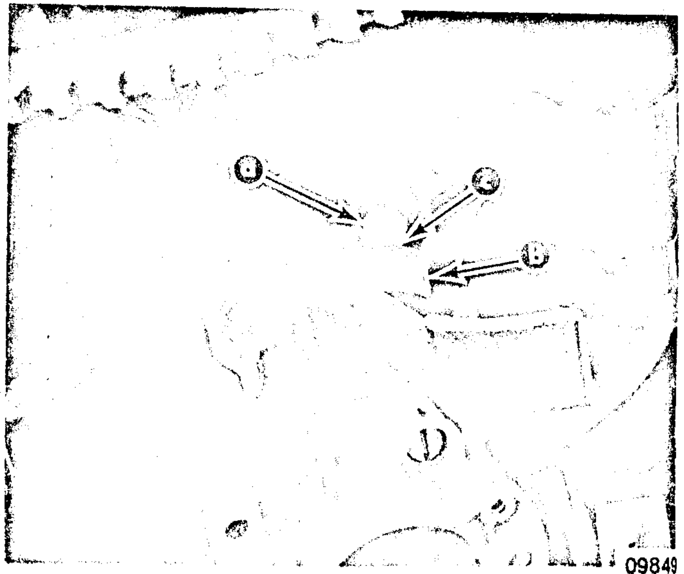
Figure 4. Secondary Pickup Screw Adjustment



a - Full Throttle Stop Screw

Figure 5. Full Throttle Stop Screw Adjustment

6. With engine not running, move throttle lever so that spark lever is against maximum spark advance stop screw, then adjust secondary pickup screw (Figure 4) so that end of screw just touches secondary lever.
7. With engine not running, move throttle lever to wide-open-throttle (WOT). Adjust full throttle stop screw (Figure 5) to allow full carburetor shutter opening at WOT. Make sure that carburetor shutters do not act as a throttle stop. Allow .010" to .015" (.25mm to .38mm) clearance between secondary pickup screw and carburetor cluster secondary lever, as shown in Figure 6.



a - Secondary Pickup Screw
b - Carburetor Cluster Secondary Lever
c - .010" to .015" Clearance

Figure 6. Full Throttle Stop Adjustment

CARBURETOR ADJUSTMENTS

1. Start engine and allow it to warm up in forward gear.
2. Adjust carburetor idle mixture screw to attain best idle in forward gear. See carburetor adjustment information, preceding.
3. Adjust engine idle RPM as follows:
   a. With engine in water, connect electrical harness and fuel line to engine. Start engine and allow to warm up.
   b. With throttle cable barrel removed from barrel retainer, adjust idle RPM to 550-600 RPM with engine running in forward gear. (Figure 7) Retighten nut on adjustment screw.
   c. With end of throttle cable connected to throttle lever, hold throttle lever against idle stop. Adjust throttle cable barrel to slip into barrel retainer on cable anchor bracket with a very light preload of throttle lever against idle stop. Lock barrel in place.
   d. Check preload on throttle cable by placing a thin piece of paper between idle stop screw and idle stop. Preload is correct when paper can be removed without tearing but has some drag on it. Readjust cable barrel, if necessary.

IMPORTANT: Excessive preload on throttle cable will cause difficulty when shifting from forward to neutral. (Readjust throttle cable barrel, if necessary.)

NOTE: Carburetor idle mixture is not equipped with adjustment screw, as are other Mercury Outboards. See carburetor jet chart, preceding, for jet change.



a - Idle RPM Screw

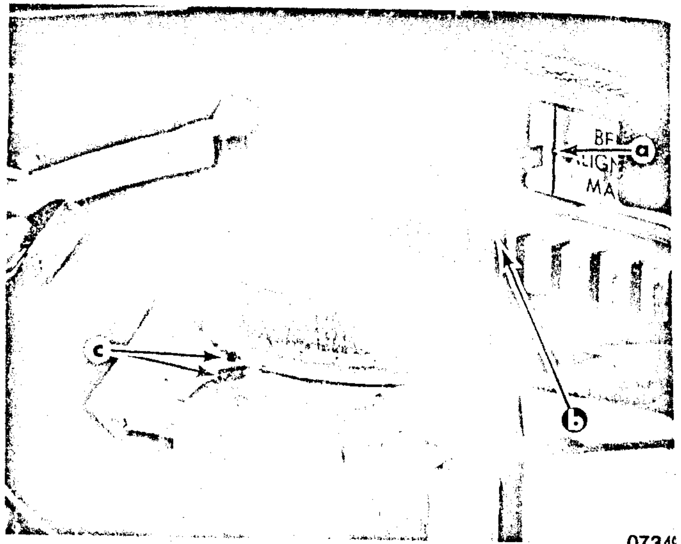
Figure 7. Engine Idle RPM Adjustment

TIMING/SYNCH./ADJUSTING
Merc 650 (1975)

Firing Order	1-2-3
Firing Sequence	120° Consecutive
Spark Plug	AC-V40FFM or Champion L76V
Spark Plug Gap	Not Adjustable
Timing Maximum	23° BTDC
Throttle Primary Pickup	3°-5° BTDC
Throttle Secondary Pickup	Not Adjustable
Full Throttle RPM	4800-5300 RPM
Idle RPM	550-600 RPM
Water Pressure (at Cylinder Block)	3 to 5 psi (.211 to .352kg/cm²) @ 2000 RPM

DISTRIBUTOR DRIVE BELT INSTALLATION

1. Place timing pointer (packed in emergency start rope pouch) into notch in cylinder block, as shown in Figure 1.
2. Rotate flywheel to align "Belt Alignment Mark" with timing pointer.
3. Align cast tab on distributor pulley with raised area on distributor adaptor. (Figure 1)
4. Place distributor drive belt over distributor pulley. Install pulley cover, screw and washer. Torque screw to 60 in. lbs. (69kg-cm).



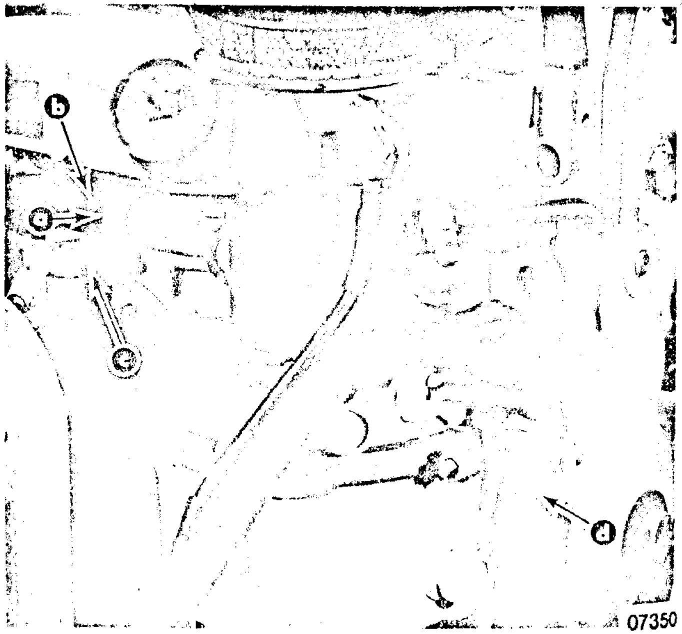
07349

a - Belt Alignment Mark b - Timing Pointer
c - Cast Tabs Aligned

Figure 1. Distributor Drive Belt Alignment

TIMING ADJUSTMENTS

1. Place engine in a test tank and connect electrical harness and fuel line.
2. Pre-set carburetor idle mixture screws at one turn out *from* seated position.

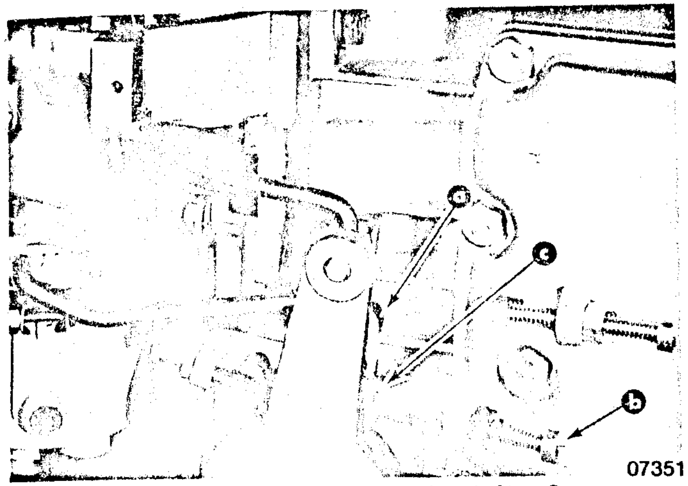


07350

a - Just Touching c - Throttle Lever
b - Throttle Actuator Cam d - Adjustment Screw

Figure 2. Throttle Primary Pickup Adjustment

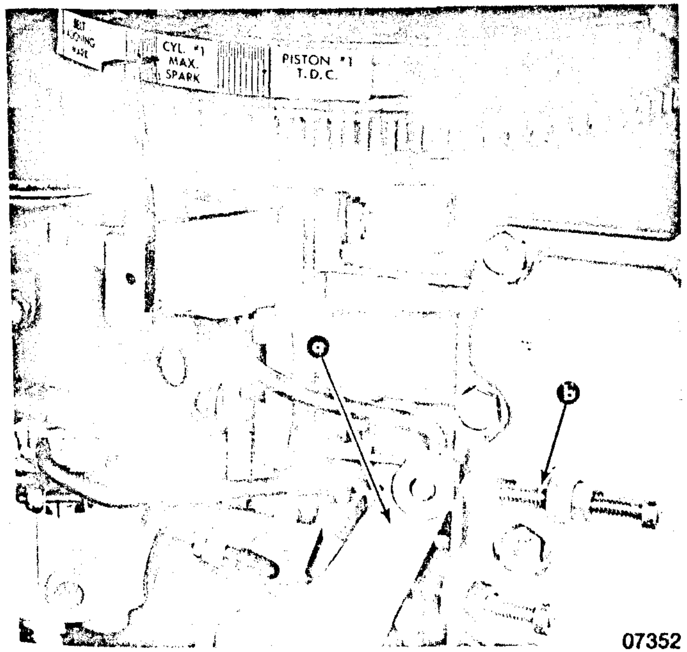
3. [illegible] Timing Light (C-91-35507) by connecting red lead to No. 1 cylinder [illegible] spark plug and connecting black leads to 12-volt battery positive (+) and negative (-) posts.
4. With engine running in forward gear, open throttle to align 3°-5° marks on flywheel decal with timing pointer. Adjust the screw between throttle and spark arm, as necessary, to cause the throttle actuator cam to just touch throttle lever pin. (Figure 2) Tighten locknut.



07351

a - Spark Advance Arm b - Spark Stop Screw
c - Just Touching

Figure 3. Adjusting Maximum Spark Advance



07352

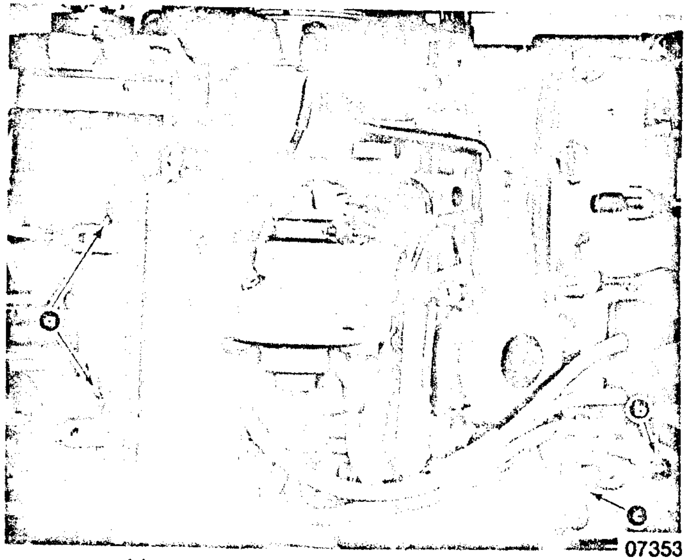
a - Throttle Arm b - Throttle Stop Screw

Figure 4. Adjusting Full Throttle Stop Screw

5. Advance throttle arm to align 23° BTDC mark on flywheel decal w... timing pointer and adjust maximum spark stop screw to just touch spa... arm. (Figure 3) Tighten locknut.
6. Return engine to idle, stop engine and remove Timing Light and timing pointer. Place timing pointer in "Emergency Starter Rope Pouch".
7. With engine stopped, advance throttle arm to wide-open-throttle (WOT) position. Adjust full throttle stop screw to allow full carburetor shutter opening, but not to allow shutters to act as a stop. Allow .010" to .015" (.25mm to .38mm) between actuator cam and pin on throttle lever. (Figure 4)

CARBURETOR ADJUSTMENTS

1. With engine running in forward gear, adjust idle mixture screws for best idle. See carburetor adjustment information, preceding.
2. Adjust idle RPM to specification in forward gear. (Figure 5) Tighten locknut.

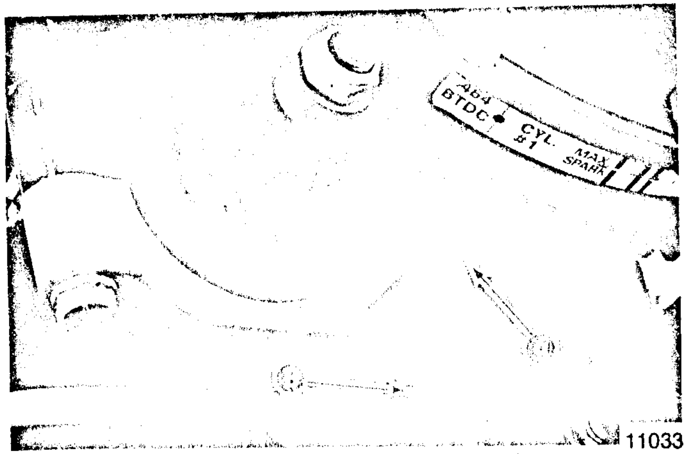


a - Idle Mixture Screws b - Idle Stop Screws
c - Just Touching

Figure 5. Adjusting Idle Stop Screw

TIMING/SYNCH./ADJUSTING Merc 650 with Distributor-Less Ignition

Firing Order	1-2-3
Firing Sequence	120° Consecutive
Spark Plug	AC-40FFM or Champion L76V
Spark Plug Gap	Not Adjustable
Timing Maximum Advance	23° BTDC @ 5300 RPM
Throttle Primary Pickup	6°-8° BTDC
Throttle Secondary Pickup	Not Adjustable
Full Throttle RPM	4800-5300 RPM
Idle RPM	550-650 RPM (6°-8° ATDC)
Water Pressure	3-Plus psi (.21kg/cm²) @ 2000 RPM



a - Timing Pointer (Adjustable) b - Timing Pointer Attaching Bolt

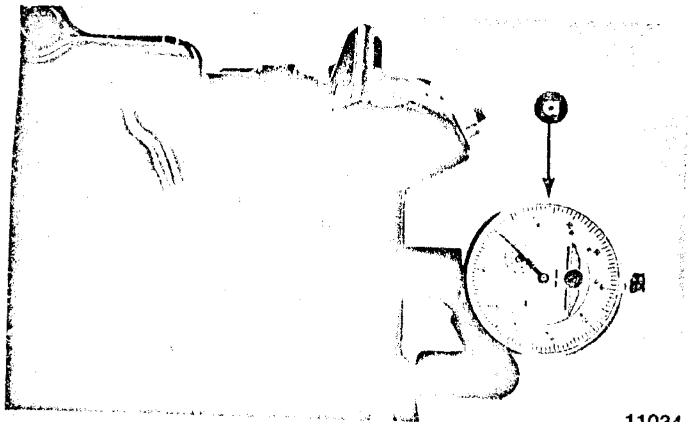
Figure 1. Timing Pointer Alignment

IMPORTANT: When timing engine with an adjustable timing pointer, as shown in Figure 1, first adjust the timing pointer BEFORE proceeding to timing adjustments.

TIMING POINTER ADJUSTMENT (Only for Engines with Adjustable Timing Pointer)

SAFETY WARNING: Engine could start when turning flywheel to check timing pointer adjustment. Remove all spark plugs from engine to prevent engine from starting.

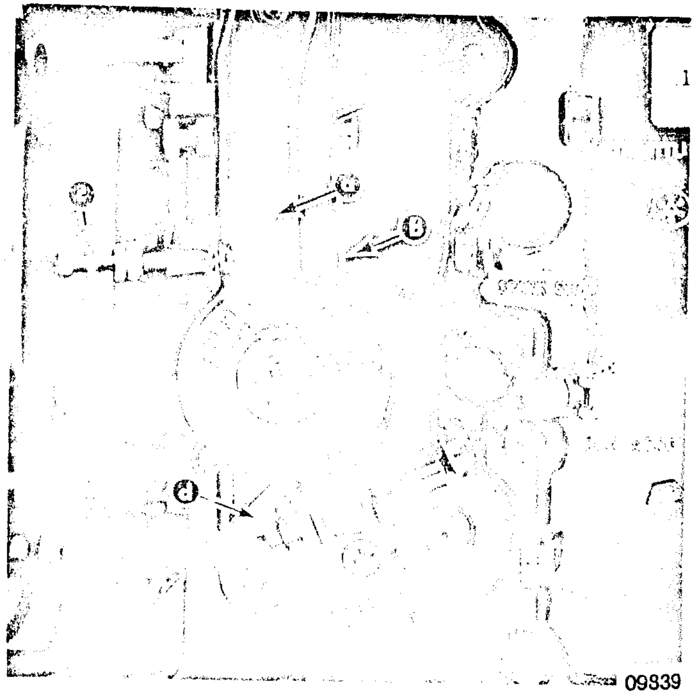
1. Remove all spark plugs and install Dial Indicator (C-91-58222A1, Figure 2) into No. 1 cylinder (top).
2. Turn flywheel in a clockwise direction until No. 1 piston is at top dead center (TDC), then set dial indicator at "0" (zero) and tighten indicator set screw.



a - Dial Indicator Installed into No. 1 Cylinder

Figure 2. Dial Indicator Installed Into No. 1 Cylinder

3. Turn flywheel counterclockwise until dial indicator needle is approximately ¼-turn beyond .464" (12mm), then turn flywheel clockwise so that dial indicator reads .464" exactly.
4. Reposition timing pointer, if necessary, so that .464" mark on timing decal is aligned with groove in timing pointer, as shown in Figure 1. Retighten pointer attaching screw. (Figure 1)
5. Remove dial indicator from cylinder and reinstall spark plugs and spark plug leads.

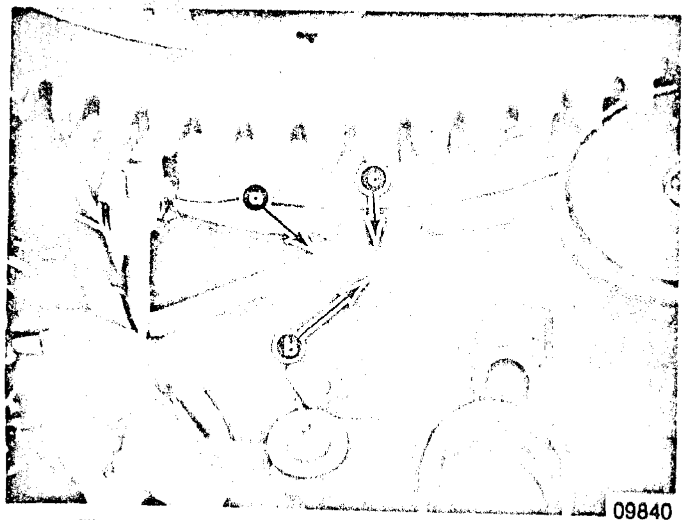


a - Throttle Lever
b - Spark Lever
c - Primary Pickup Adjustment Screw
d - Idle RPM Screw

Figure 3. Throttle Primary Pickup Adjustment

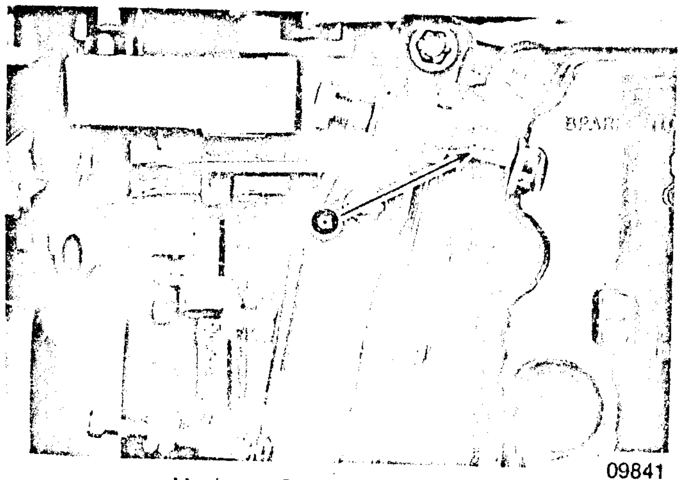
TIMING ADJUSTMENTS

1. Place engine in a test tank and connect electrical harness to engine.
2. Connect Timing Light (C-91-35507) by connecting red lead to No. 1 (top) spark plug and connecting black leads to 12-volt battery positive (+) and and negative (-) posts.
3. Pre-set carburetor idle mixture screws at 1½ to 1¾ turns out from seated position.
4. Crank engine with starter motor while moving throttle lever to align throttle primary pickup specification on timing decal with timing pointer. Without moving throttle lever, adjust the screw between throttle and spark levers (Figure 3) so that the throttle actuator cam just touches the carburetor throttle cluster pin, then tighten locknut. (Figure 4)



a - Throttle Actuator Cam
b - Carburetor Cluster Pin
c - Just Touching

Figure 4. Throttle Primary Pickup Adjustment



a - Maximum Spark Advance Screw

Figure 5. Maximum Spark Advance Adjustment

5. Crank engine with starter motor while moving throttle lever to align 28° BTDC mark on timing decal with timing pointer. Adjust maximum spark stop screw to just touch spark arm and tighten locknut. Recheck maximum spark advance. (Figure 5)

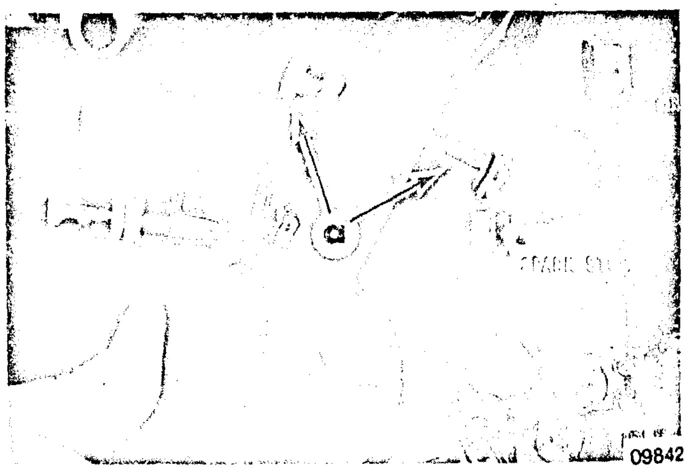
NOTE: Due to electronic characteristic of this ignition system, setting the maximum spark advance at 28° BTDC at cranking RPM will result in a maximum spark advance of 23° at 5300 RPM.

6. Move throttle lever to wide-open-throttle (WOT) and adjust throttle stop screw (Figure 6) to allow full carburetor shutter opening but so that carburetor shutter does not act as a stop. Allow .010" to .015" (.25mm to .38mm) clearance between throttle actuator cam and carburetor cluster pin with throttle lever against throttle stop screw. (Figure 7) Tighten locknut.
7. Move throttle lever to idle position and remove Timing Light.

CARBURETOR ADJUSTMENTS

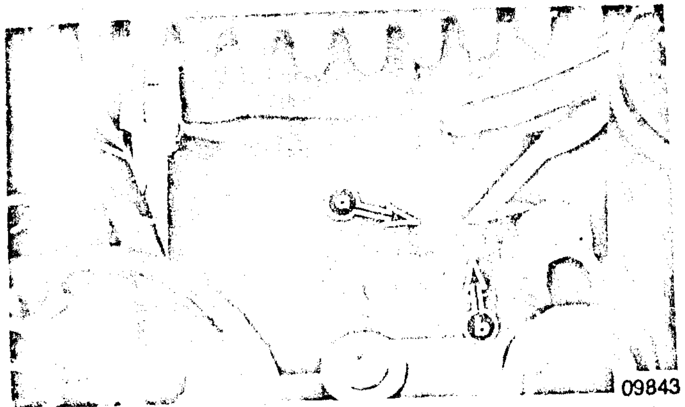
1. Connect fuel line to engine. Start engine and allow it to warm up in forward gear.
2. Adjust carburetor idle mixture screws to attain best idle in forward gear. See carburetor adjustment information, preceding.
3. Adjust engine idle RPM as follows:
   a. With engine in water, connect electrical harness and fuel line to engine. Start engine and allow to warm up.
   b. With throttle cable barrel removed from barrel retainer, adjust idle RPM to 550-650 RPM with engine running in forward gear. Retighten nut on adjustment screw.
   c. With end of throttle cable connected to throttle lever, hold throttle lever against idle stop. Adjust throttle cable barrel to slip into barrel retainer on cable anchor bracket with a very light *preload* of throttle lever against idle stop. Lock barrel in place.
   d. Check preload on throttle cable by placing a thin piece of paper between idle stop screw and idle stop. Preload is correct when paper can be removed without tearing but has some drag on it. Readjust cable barrel, if necessary.

IMPORTANT: Excessive preload on throttle cable will cause difficulty when shifting from forward to neutral. (Readjust throttle cable barrel, if necessary.)



a - Full Throttle Stop Screw

Figure 6. Full Throttle Stop Screw Adjustment

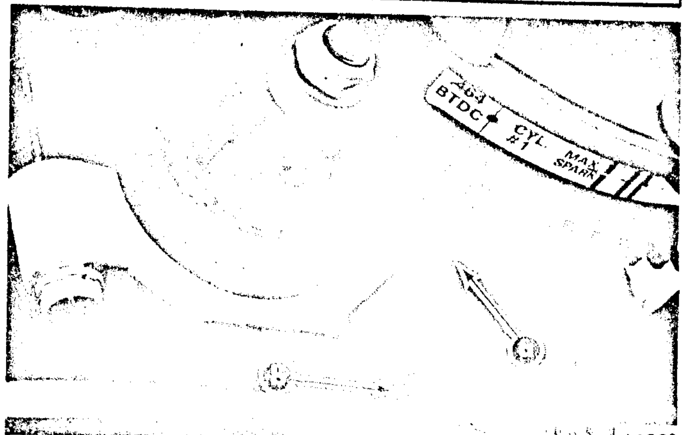


a - Throttle Actuator Cam　　b - Carburetor Cluster Pin

Figure 7. Full Throttle Stop Adjustment

TIMING/SYNCH./ADJUSTING
Merc 700

Firing Order	1-2-3
Firing Sequence	120° Consecutive
Spark Plug	AC-V40FFM or Champion L76V
Spark Plug Gap	Not Adjustable
Timing Maximum Advance	23° BTDC @ 5500 RPM
Throttle Primary Pickup	Not Adjustable
Throttle Secondary Pickup	At Maximum Spark (Set Statically)
Full Throttle RPM	5000-5500 RPM
Idle RPM	650-750 RPM (6°-8° ATDC) in Gear
Water Pressure	3-Plus psi (.211kg/cm²) @ 2000 RPM



11033

a - Timing Pointer (Adjustable) b - Timing Pointer Attaching Bolt

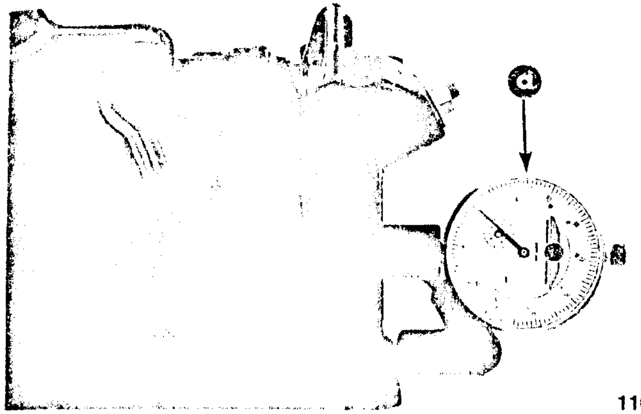
Figure 1. Timing Pointer Alignment

IMPORTANT: When timing engine with an adjustable timing pointer, as shown in Figure 1, first adjust the timing pointer BEFORE proceeding to timing adjustments.

TIMING POINTER ADJUSTMENT (Only for Engines with Adjustable Timing Pointer)

> **SAFETY WARNING: Engine could start when turning flywheel to check timing pointer adjustment. Remove all spark plugs from engine to prevent engine from starting.**

1. Remove all spark plugs and install Dial Indicator (C-91-58222A1, Figure 2) into No. 1 cylinder (top).
2. Turn flywheel in a clockwise direction until No. 1 piston is at top dead center (TDC), then set dial indicator at "0" (zero) and tighten indicator set screw.
3. Turn flywheel counterclockwise until dial indicator needle is approximately ¼-turn beyond .464" (12mm), then turn flywheel clockwise so that dial indicator reads .464" exactly.



11034

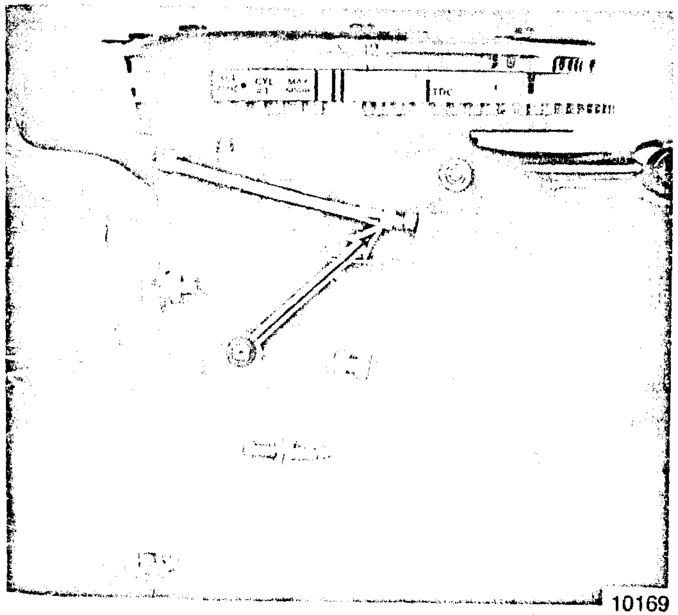
a - Dial Indicator Installed into No. 1 Cylinder

Figure 2. Dial Indicator Installed into No. 1 Cylinder

4. Reposition timing pointer, if necessary, so that .464" mark on timing decal is aligned with groove in timing pointer, as shown in Figure 1. Retighten pointer attaching screw. (Figure 1)
5. Remove dial indicator from cylinder and reinstall spark plugs and spark plug leads.

TIMING ADJUSTMENTS

1. Place engine in test tank or, if engine is mounted on boat, place boat and engine in water. Connect electrical harness and fuel line to engine.
2. Connect Timing Light (C-91-35507) to engine by connecting red lead to No. 1 (top) spark plug and connecting black leads to 12-volt battery (+) positive and (-) negative posts.

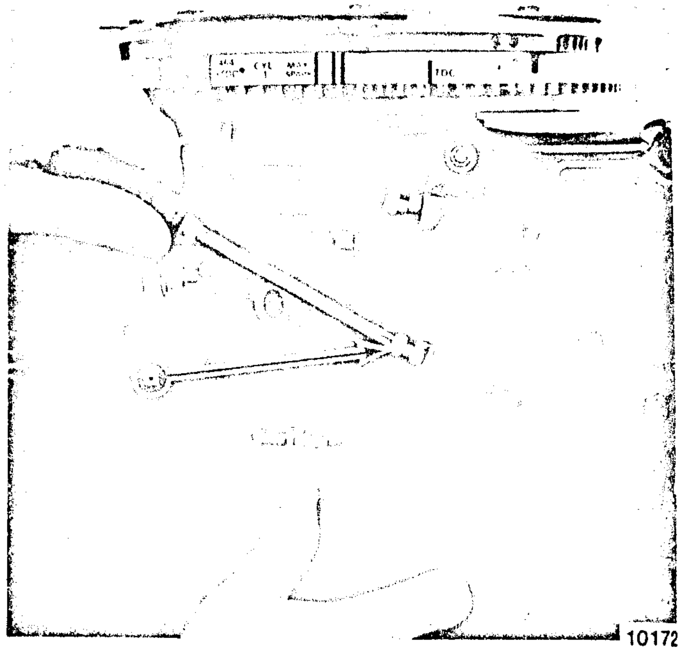


10169

a - Maximum Spark Advance Screw

Figure 3. Maximum Spark Advance Adjustment

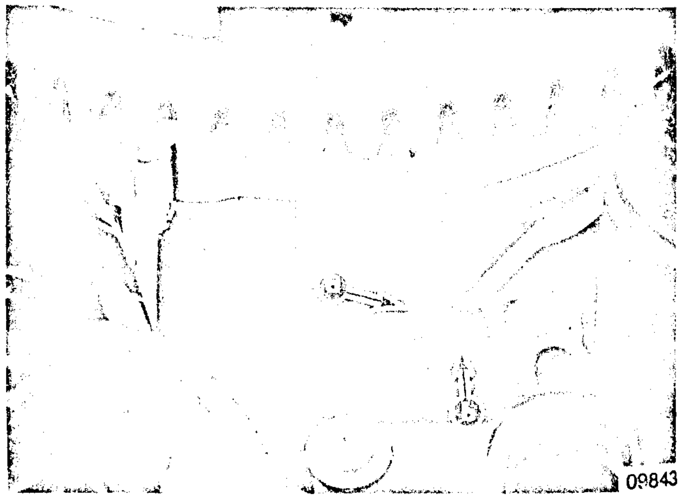
3. Pre-set carburetor idle mixture screws at 1½ to 1¾ turns out from seated position.
4. Place engine in forward gear and run at 5000-to-5500 RPM. Adjust maximum spark advance screw (Figure 3) so that timing pointer is aligned with 23° mark on timing decal. Retighten nut on adjustment screw, move throttle back to idle and turn off engine. Remove timing light.



10172

a - Full Throttle Stop Screw

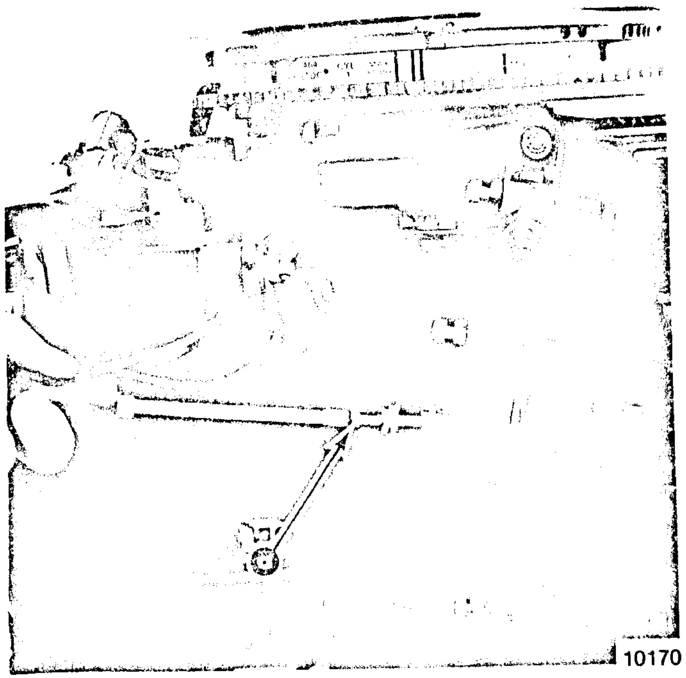
Figure 4. Full Throttle Stop Screw Adjustment



09843

a - Throttle Actuator Cam b - Carburetor Cluster Pin

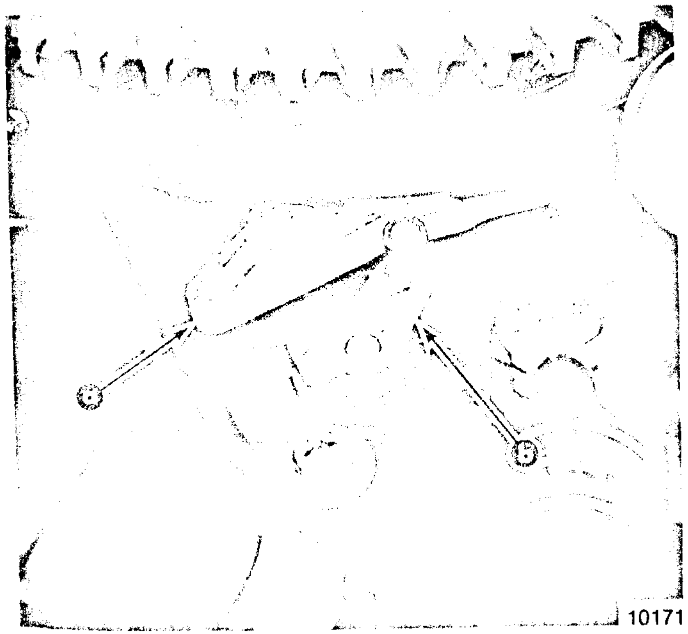
Figure 5. Full Throttle Stop Adjustment



10170

a - Secondary Pickup Screw

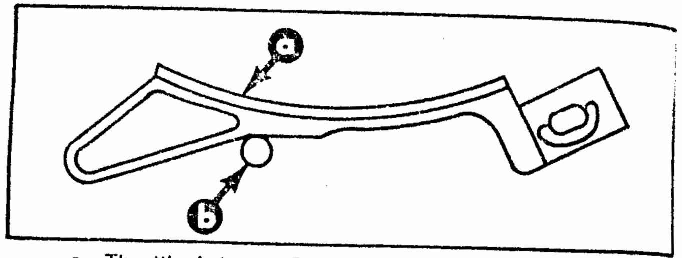
Figure 6. Secondary Pickup Screw Adjustment



10171

a - Throttle Actuator Cam b - Carburetor Cluster Pin

Figure 7. Secondary Pickup Adjustment



a - Throttle Actuator Cam b - Secondary Pickup

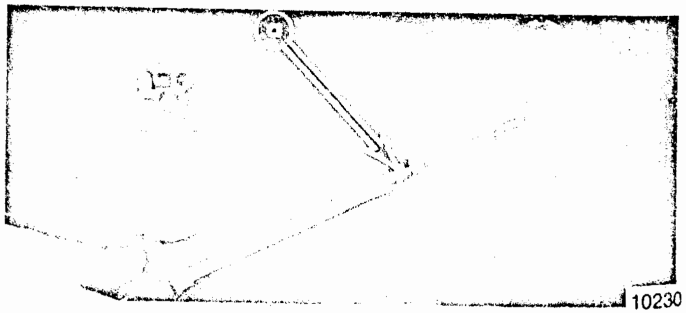
Figure 8. Secondary Pickup

5. With engine not running, move throttle lever to wide open throttle (WOT) and adjust throttle stop screw (Figure 4) to allow full carburetor shutter opening at WOT. Make sure that carburetor shutter does not act as a throttle stop. Allow .010" to .015" (.25mm to .38mm) clearance between throttle actuator cam and carburetor cluster pin at WOT, as shown in Figure 5. Retighten nut on adjustment screw.
6. With engine not running, move spark lever to maximum spark, then adjust secondary pickup adjustment screw (Figure 6) so that carburetor cluster pin is on secondary pickup point on throttle actuator cam, as shown in Figures 7 and 8. Retighten nut on adjustment screw.
7. Move throttle lever to idle position.

CARBURETOR ADJUSTMENTS

1. Start engine and allow it to warm up in forward gear.
2. Adjust carburetor mixture screws to attain best idle in forward gear. See carburetor adjustment information, preceding.
3. Adjust engine idle RPM as follows:
   a. With engine in water, connect electrical harness and fuel line to engine. Start engine and allow to warm up.
   b. With throttle cable barrel removed from barrel retainer, adjust idle RPM to 650-750 RPM with engine running in forward gear. (Figure 9) Retighten nut on adjustment screw.
   c. With end of throttle cable connected to throttle lever, hold throttle lever against idle stop. Adjust throttle cable barrel to slip into barrel retainer on cable anchor bracket with a very light preload of throttle lever against idle stop. Lock barrel in place.
   d. Check preload on throttle cable by placing a thin piece of paper between idle stop screw and idle stop. Preload is correct when paper can be removed without tearing but has some drag on it. Readjust cable barrel, if necessary.

IMPORTANT: Excessive preload on throttle cable will cause difficulty when shifting from forward to neutral. (Readjust throttle cable barrel, if necessary.)



a - Idle RPM Screw

Figure 9. Idle RPM Adjustment

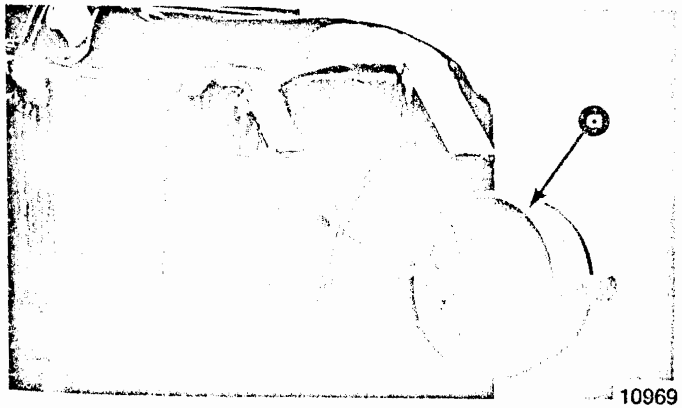
TIMING/SYNCH./ADJUSTING
Merc 800 and 850 (Serial No. 4366802 and Above) with Distributor-Less Ignition

Firing Order	1-3-2-4
Firing Sequence	90° Consecutive
Spark Plug	AC-V40FFK or Champion L78V
Spark Plug Gap	Not Adjustable
Timing Maximum	27° BTDC
Throttle Primary Pickup	2°-4° BTDC (Below Serial No. 4423112) 2° BTDC to 2° ATDC (Serial No. 4423112 and Above)
Throttle Secondary Pickup	Not Adjustable
Full Throttle RPM	5000-5500 RPM
Idle RPM	550-650 RPM (5°-8° ATDC) in Gear
Water Pressure (at Cylinder Block)	2 to 5 psi (.141 to .352kg/cm²) @ 2000 RPM

TIMING POINTER ADJUSTMENT

SAFETY WARNING: Engine possibly could start when turning flywheel to check timing pointer adjustment. Remove all spark plugs from engine to prevent engine from starting.

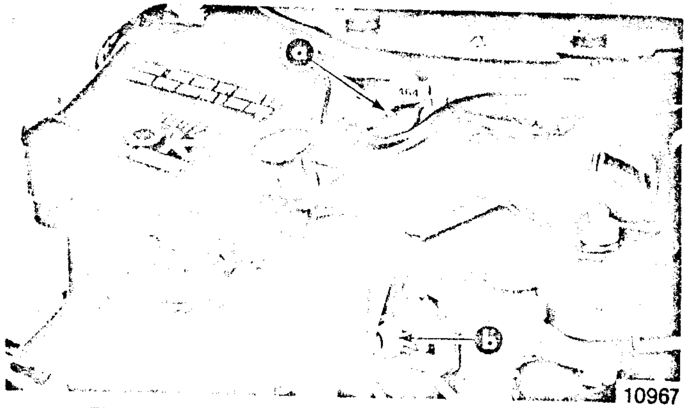
1. Remove all spark plugs and install Dial Indicator (C-91-58222A1, Figure 1) into No. 1 cylinder (top).
2. Turn flywheel in a clockwise direction until No. 1 piston is at top dead center (TDC), then set dial indicator at "0" (zero) and tighten indicator set screw.



a - Dial Installed into No. 1 Cylinder

Figure 1. Dial Indicator Installed into No. 1 Cylinder

3. Turn flywheel counterclockwise until dial indicator needle is approx. ¼ turn beyond .464" (12mm), then turn flywheel clockwise so that dial indicator reads .464" exactly.
4. Reposition timing pointer, if necessary, so that timing pointer is aligned with .464" mark on timing decal, as shown in Figure 2. Retighten pointer attaching screw. (Figure 2)
5. Remove dial indicator from cylinder and reinstall spark plugs and spark plug leads.



10967

a - Timing Pointer b - Timing Pointer Attaching Bolt

Figure 2. Timing Pointer Alignment

TIMING ADJUSTMENTS

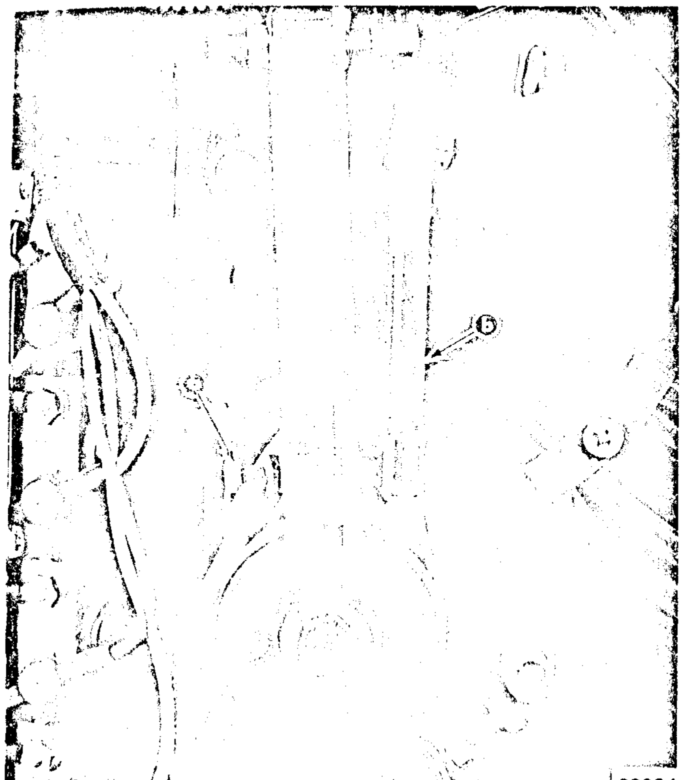
1. Place engine in test tank or, if engine is mounted on boat, place boat and engine in water. Connect electrical harness and fuel line to engine.
2. Pre-set carburetor idle mixture screws at 1½ turns out from lightly seated position.
3. Connect Timing Light to No. 1 (top) spark plug.
4. With engine running in forward gear, move throttle lever so that throttle primary pickup cam just touches primary pickup on carburetor cluster, as shown in Figure 3. Then, without moving throttle lever, adjust primary pickup screw (Figure 4) so that timing pointer is aligned with specified throttle pickup on timing decal. Retighten nut on adjustment screw.



09835

a - Primary Pickup Cam b - Carburetor Cluster Pin
c - Just Touching

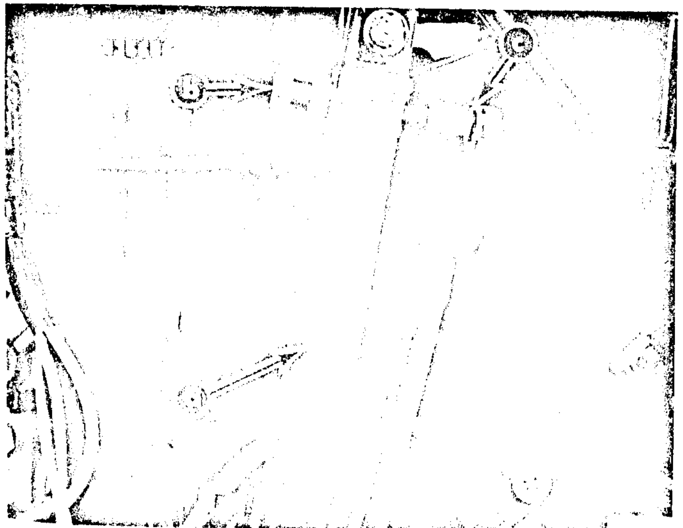
Figure 3. Throttle Primary Pickup Adjustment



09834

a - Primary Pickup Adjustment Screw b - Throttle Lever

Figure 4. Throttle Primary Pickup Screw Adjustment

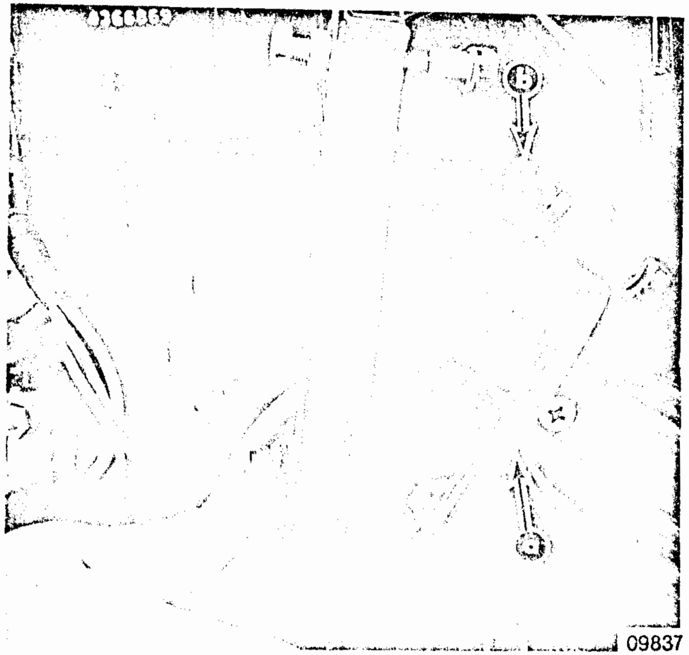


09836

a - Spark Lever b - Spark Stop Screw c - Just Touching

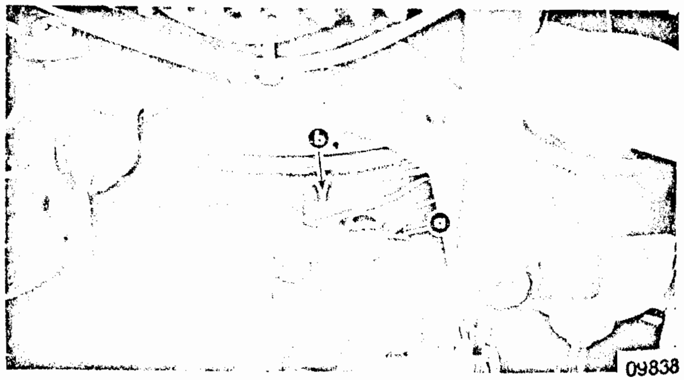
Figure 5. Maximum Spark Advance Adjustment

5. With engine running in forward gear, advance engine speed so that timing pointer is aligned with specified maximum spark advance on timing decal. Adjust maximum spark advance stop screw so that end of screw just touches spark lever, as shown in Figure 5. Retighten nut on adjustment stop screw. Move throttle back to idle and turn off engine. Remove timing light.
6. With engine not running, advance throttle lever to wide-open-throttle (WOT) and adjust full throttle stop screw (Figure 6) to allow full carburetor shutter opening at WOT. Make sure that carburetor shutters do not act as a throttle stop. Allow .010" to .015" (.75mm to .38mm) clearance between throttle cam and pin on carburetor cluster when throttle is WOT, as shown in Figure 7.



a - Throttle Lever b - Throttle Stop Screw

Figure 6. Full Throttle Stop Screw Adjustment



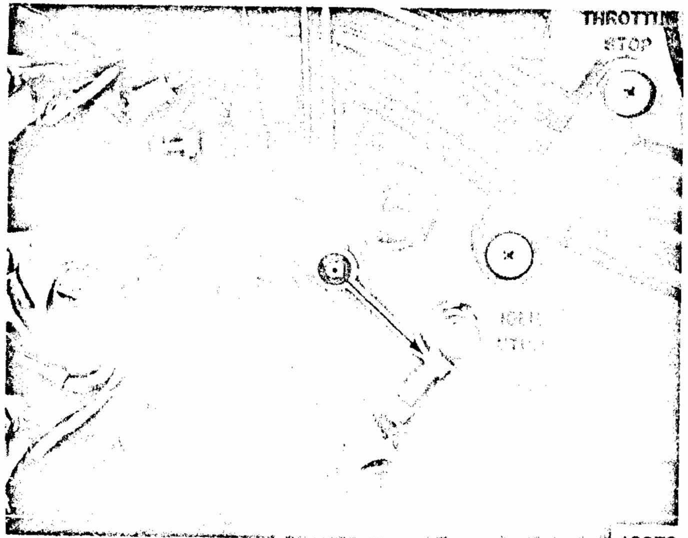
a - Carburetor Cluster Pin b - Throttle Cam

Figure 7. Full Throttle Stop Adjustment

CARBURETOR ADJUSTMENTS

1. Start engine and allow engine to warm up in forward gear.
2. Adjust carburetor idle mixture screws to attain best idle in forward gear. See carburetor adjustment information, preceding.
3. Adjust engine idle RPM as follows:
   a. With engine in water, connect electrical harness and fuel line to engine. Start engine and allow to warm up.
   b. With throttle cable barrel removed from barrel retainer, adjust idle RPM to 550-650 RPM with engine running in forward gear. (Figure 8) Retighten nut on adjustment screw.
   c. With end of throttle cable connected to throttle lever, hold throttle lever against idle stop. Adjust throttle cable barrel to slip into barrel retainer on cable anchor bracket with a very light preload of throttle lever against idle stop. Lock barrel in place.
   d. Check preload on throttle cable by placing a thin piece of paper between idle stop screw and idle stop. Preload is correct when paper can be removed without tearing but has some drag on it. Readjust cable barrel, if necessary.

IMPORTANT: Excessive preload on throttle cable will cause difficulty when shifting from forward to neutral. (Readjust throttle cable barrel, if necessary.)



a - Idle RPM Screw

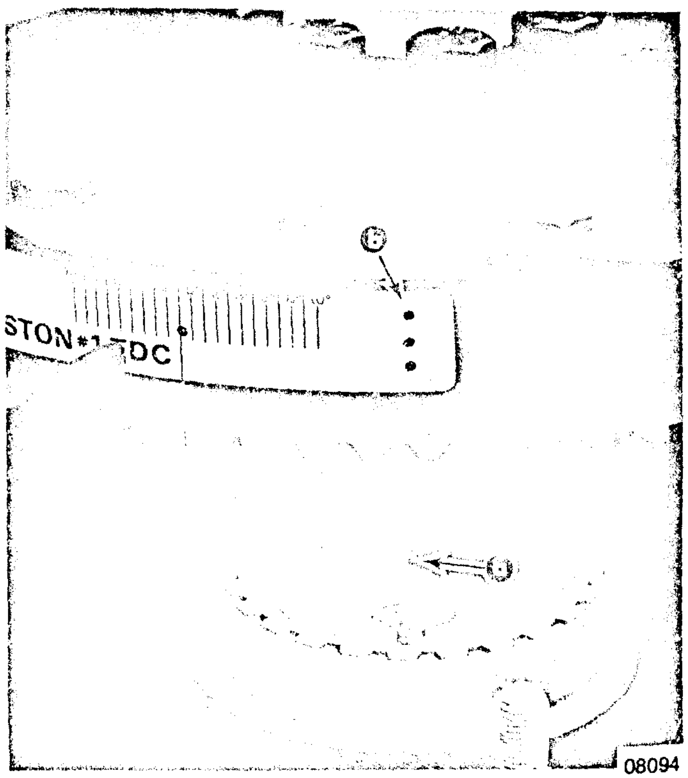
Figure 8. Engine Idle RPM Adjustment

TIMING/SYNCH./ADJUSTING Merc 850 (Below Serial No. 4366801)

Firing Order	1-3-2-4
Firing Sequence	90° Consecutive
Spark Plug	AC-40FFM or Champion L76V
Spark Plug Gap	Not Adjustable
Timing Maximum	27° BTDC
Throttle Primary Pickup	3°-5° BTDC
Throttle Secondary Pickup	27° BTDC
Full Throttle RPM	4800-5500 RPM
Idle RPM	550-600 RPM
Water Pressure (at Cylinder Block)	2 to 5 psi (.141 to .352kg/cm²) @ 2000 RPM

DISTRIBUTOR DRIVE BELT INSTALLATION

1. Rotate flywheel until 3 dots on flywheel timing decal are aligned with center of distributor shaft. (Figure 1)



a - Arrow b - 3 Dots on Timing Decal

Figure 1. Distributor Drive Belt Installation

2. Rotate distributor pulley until arrow (cast into pulley) is pointing at 3 dots on flywheel decal. Slip drive belt over pulley and install pulley cover, washer and bolt. Torque cover bolt to 60 in. lbs. (69kg-cm).

NOTE: When installing timing belt on 4 and 6-cylinder outboards with Thunderbolt Ignition, the arrow on the pulley may not align directly with the mark on the flywheel. If this should occur, align the arrow slightly clockwise (as viewed from front of outboard). This will appear to be approximately ½-tooth off. (Figure 2) Installing the belt ½-tooth to the left (counterclockwise) will make engine synchronization difficult and result in rough engine operation.

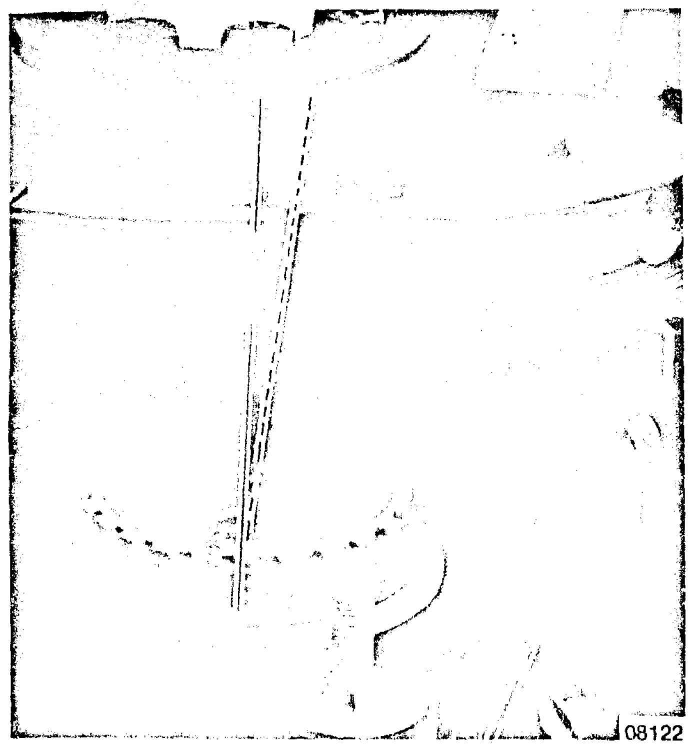
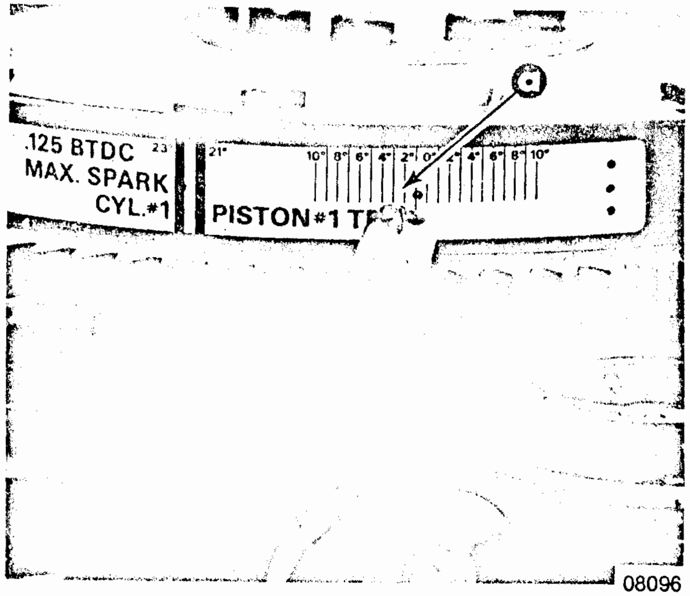


Figure 2. Alignment ½-Tooth Clockwise

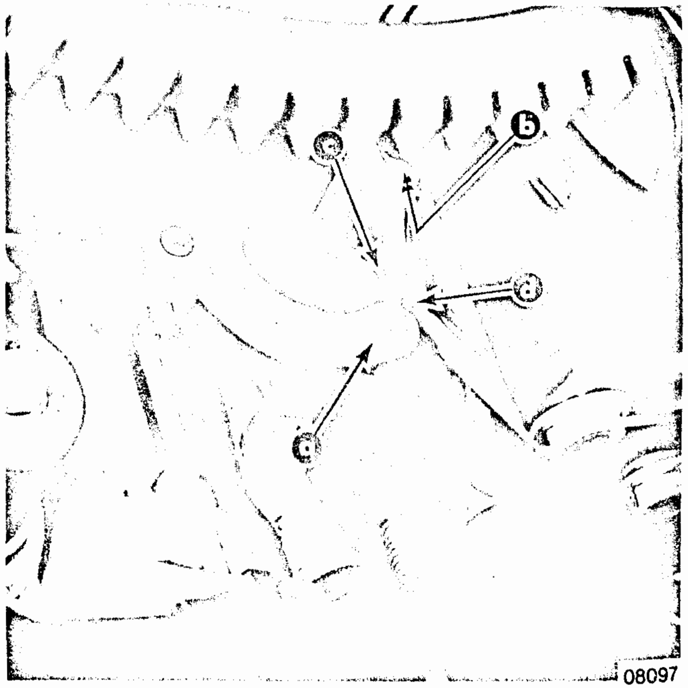
TIMING ADJUSTMENTS

1. Place engine in a test tank and connect electrical harness and fuel line.
2. Press carburetor idle mixture screws 1¼ turns out from seated position.
3. Install Timing Light (C-91-35507) by connecting red lead to No. 1 (top) spark plug and connecting black leads to 12-volt battery positive (+) and negative (-) posts.
4. With engine running in forward gear, move the throttle lever to align 3° to 5° BTDC on timing decal with timing pointer. (Figure 3)
5. With throttle positioned as in Step 4, loosen 2 actuator plate retainer bolts (Figure 4) and rotate actuator plate, as necessary, so that primary cam just touches primary pickup lever on carburetor cluster. (Figure 4) Tighten 2 bolts.
6. Advance throttle lever to align 27° BTDC mark on timing decal with timing pointer (Figure 5) and adjust maximum spark stop screw (Figure 6) to just touch distributor adaptor. Tighten locknut and recheck maximum spark advance.



a - To Specification

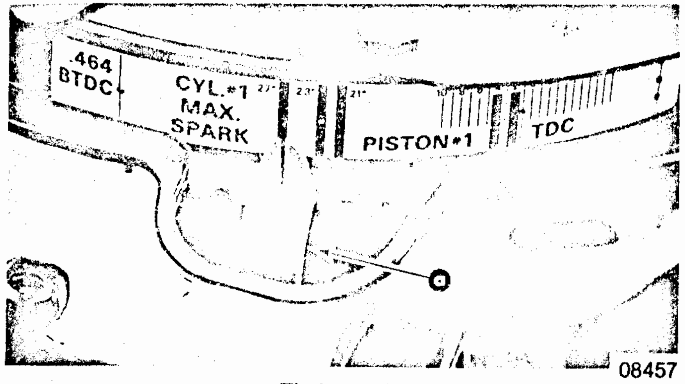
Figure 3. Adjusting Throttle Primary Pickup



a - Primary Pickup Lever
b - Actuator Plate Retainer Bolts (Out of Sight)
c - Throttle Cam
d - Just Touching

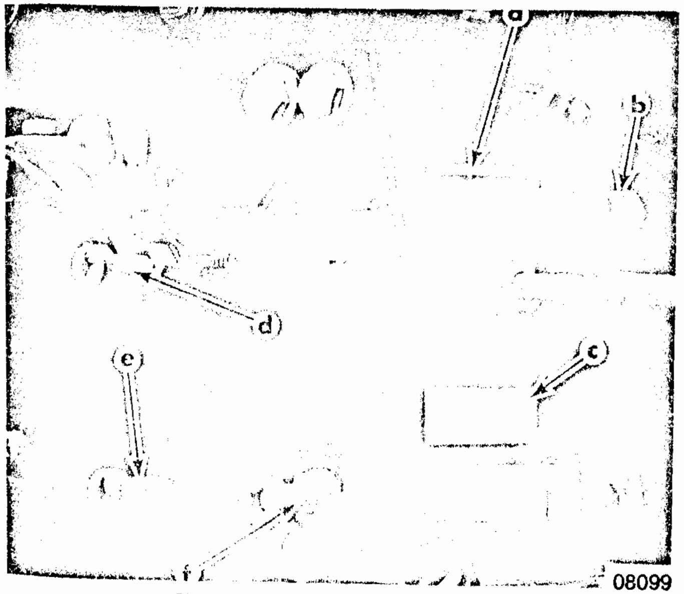
Figure 4. Throttle Cam Just Touching Carburetor Primary Lever

7. Return engine to idle and stop engine. Remove Timing Light.
8. With engine stopped, advance throttle lever to maximum spark advance screw but not actuating the economizer collar spring, adjust the secondary throttle pickup screw (Figure 6) so that the secondary pickup just touches secondary lever on carburetor cluster. (Figure 7) Tighten locknut.
9. Advance throttle lever to wide-open-throttle (WOT) position. Adjust throttle stop screw (Figure 6) to allow full carburetor shutter opening, but not to allow shutters to act as a stop. Allow approximately 1/32" (.8mm) clearance between throttle secondary pickup and secondary lever on carburetor cluster, tighten locknut and recheck adjustment.



a - Timing Pointer

Figure 5. Aligning 27° BTDC Mark with Timing Pointer

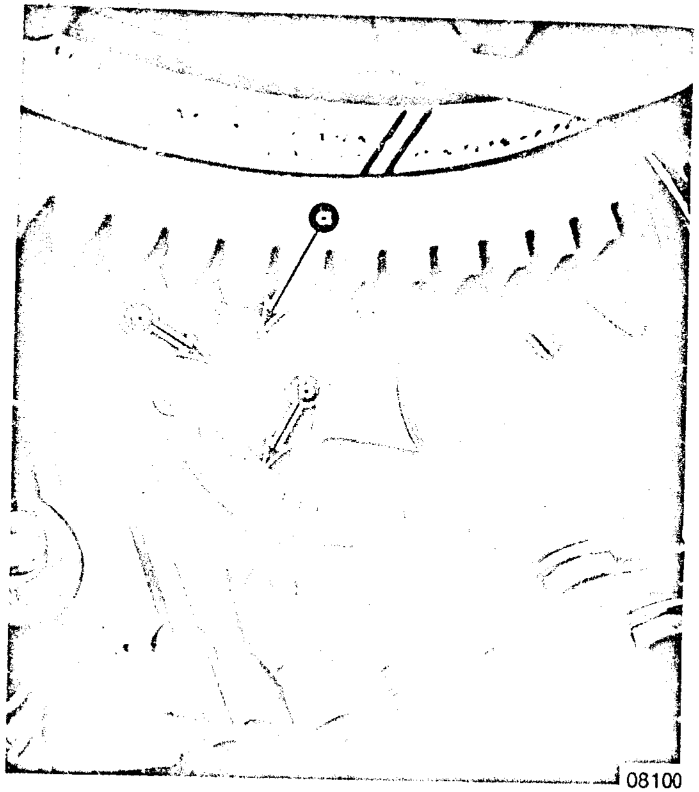


a - Throttle Actuator
b - Secondary Throttle Pickup Screw
c - Economizer Collar Spring
d - Throttle Stop Screw
e - Maximum Spark Stop Screw
f - Idle RPM Screw

Figure 6. Adjusting Secondary Throttle Pickup

CARBURETOR ADJUSTMENTS

1. With engine running in forward gear, adjust idle mixture screws for best idle. See carburetor adjustment information, preceding.
2. Adjust idle RPM to specification in forward gear and tighten locknut. (Figure 6)



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a - Secondary Pickup b - Secondary Lever c - Just Touching

Figure 7. Adjusting Secondary Throttle Pickup

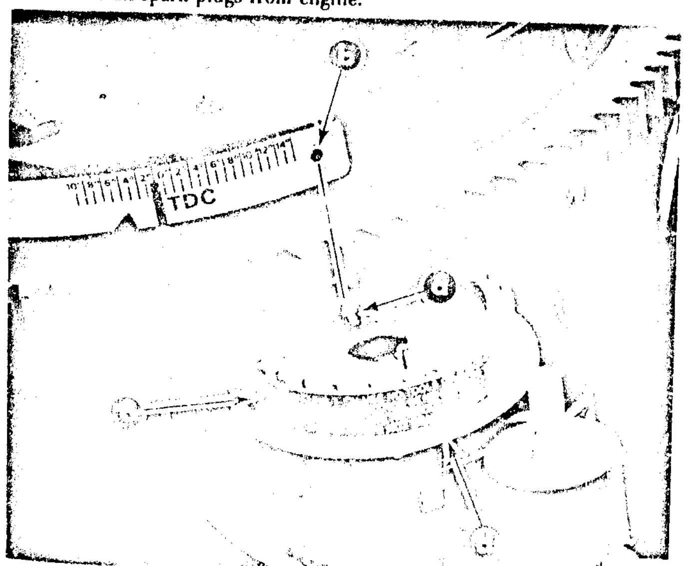
TIMING/SYNCH./ADJUSTING Merc 900-1400 and 1500XS (1978) Models and Merc 1150 and 1500 In-Line Models

Firing Order	1-4-5-2-3-6
Firing Sequence	60° Consecutive
Spark Plug	AC-440FFM or Champion L76V
Spark Plug Gap	Not Adjustable
Timing Maximum Advance	21° BTDC
Throttle Primary Pickup	4°-6° BTDC
Throttle Secondary Pickup	21° BTDC
Full Throttle RPM	4500-5000 (Merc 900) 5000-5500 RPM (Merc 1150) 5300-5800 RPM (1400-1500) 5800-6300 RPM (1500XS)
Idle RPM	550-600 RPM in Gear
Water Pressure (at Cylinder Block)	2 to 5 psi (.14 to .35kg/cm²) @ 2000 RPM

DISTRIBUTOR DRIVE BELT INSTALLATION

SAFETY WARNING: Engine possibly could start when turning flywheel to install distributor drive belt, therefore, remove all spark plugs to prevent engine from starting.

1. Remove all spark plugs from engine.



10981

a - Cast Arrow
b - Alignment Dot
c - Distributor Drive Belt
d - Distributor Pulley

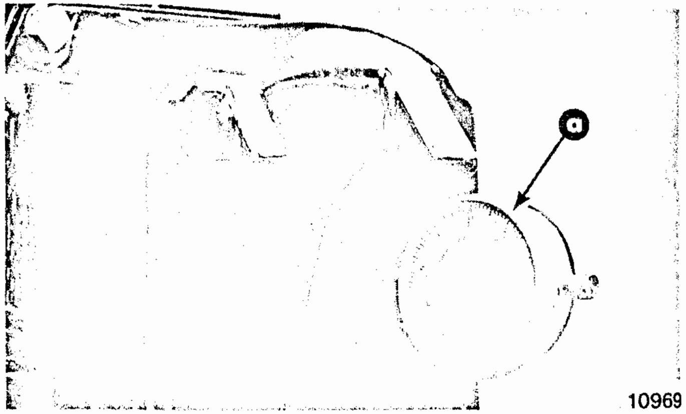
Figure 1. Distributor Drive Belt Installation

2. Turn flywheel until single dot (3 dots on pre-1978 Merc 1150 and 1500 models) on flywheel timing decal is aligned with center of distributor shaft, as shown in Figure 1.
3. Turn distributor pulley until arrow (Figure 1) is aligned with single dot (3 dots on pre-1978 Merc 1150 and 1500 models) on the timing decal, then slip timing belt over pulley.

IMPORTANT: When installing timing belt on engines with Thunderbolt Ignition, arrow on pulley may not align directly with dot(s) on flywheel. If this should occur, align arrow slightly <u>counterclockwise.</u> This will appear to be approximately ½-tooth off. If arrow is aligned slightly clockwise, instead of counter-clockwise, this will make engine synchronization difficult and result in rough engine operation.

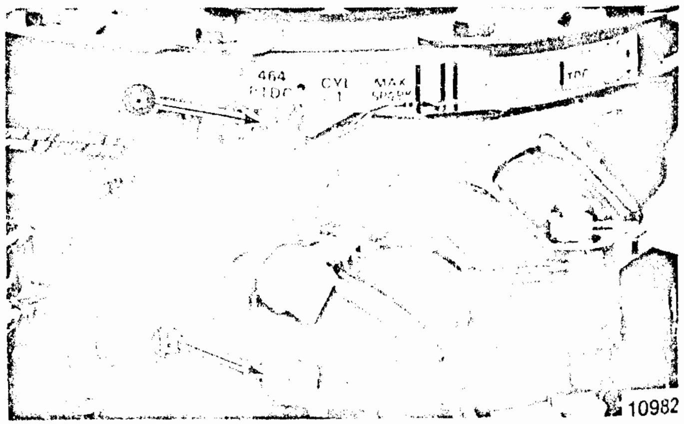
TIMING POINTER ADJUSTMENT

SAFETY WARNING: Engine could start when turning fly-wheel to check timing pointer adjustment. Remove all spark plugs from engine to prevent engine from starting.



a - Dial Installed into No. 1 Cylinder

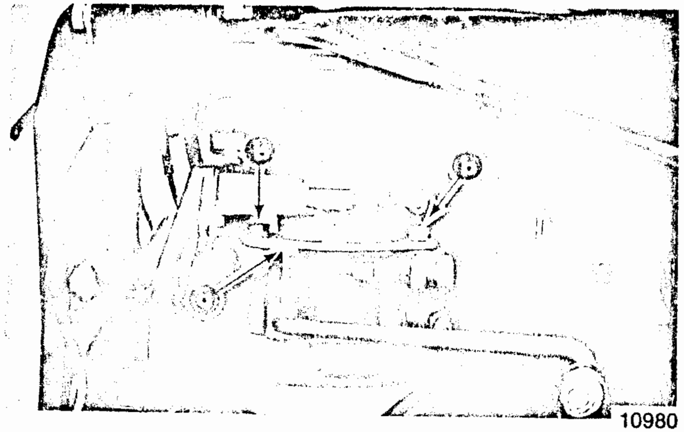
Figure 2. Dial Indicator Installed Into No. 1 Cylinder



a - Timing Pointer b - Timing Pointer Attaching Bolt

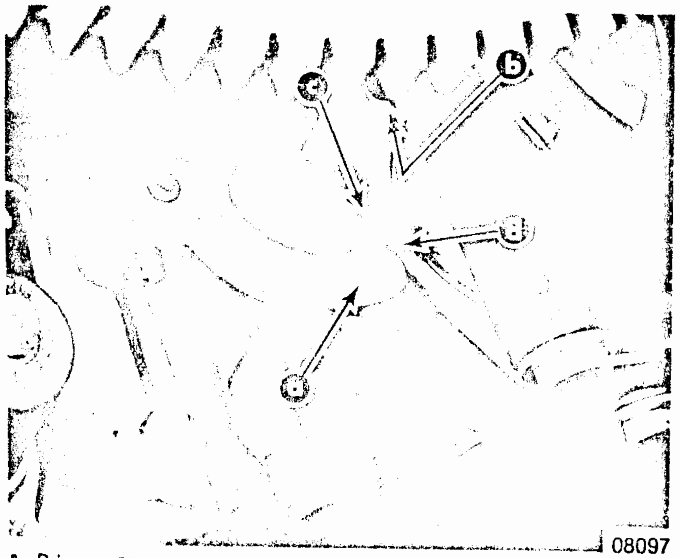
Figure 3. Timing Pointer Alignment

1. Remove all spark plugs from engine and install Dial Indicator (C-91-58222A1) into No. 1 cylinder, as shown in Figure 2.
2. Turn flywheel clockwise until No. 1 piston is at top dead center (TDC). Set dial indicator at "0" (zero) and tighten indicator set screw.
3. Turn flywheel counterclockwise until dial indicator needle is approx. ¼-turn beyond .464" (12mm), then turn flywheel clockwise so that dial indicator reads .464" exactly.
4. Reposition timing pointer, if necessary, so that timing pointer is aligned with .464" mark on timing decal, as shown in Figure 3. Retighten pointer attaching screw.
5. Remove Dial Indicator from cylinder and reinstall spark plugs and spark plug leads.



a - Throttle Actuator Plate
b - Actuator Plate Retaining Bolts

Figure 4. Throttle Actuator Plate

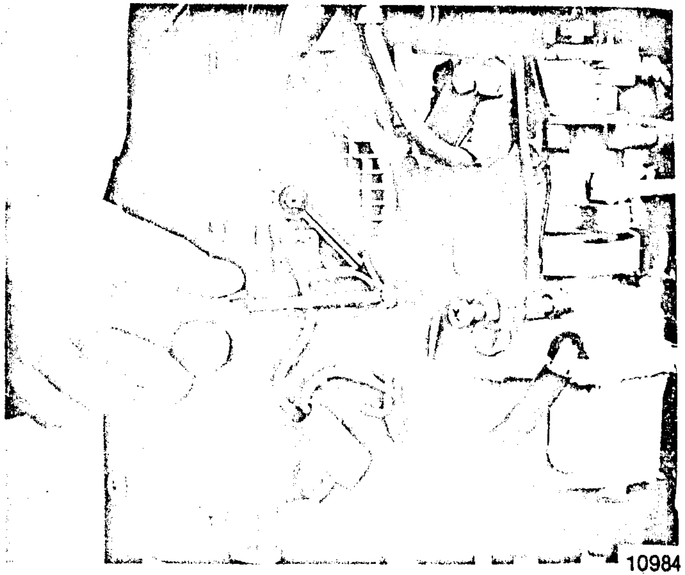


a - Primary Pickup Lever c - Throttle Cam
b - Actuator Plate Retainer Bolts (Out of Sight) d - Just Touching

Figure 5. Primary Throttle Pickup Adjustment

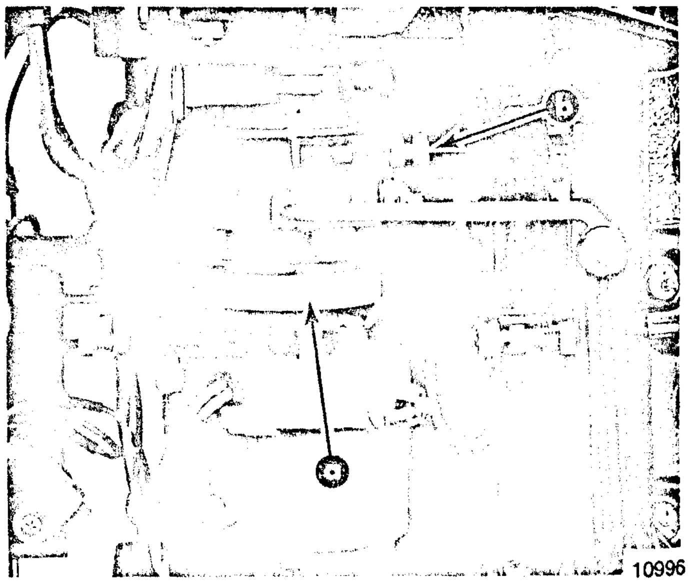
TIMING ADJUSTMENTS

1. Place engine in test tank or, if engine is mounted on boat, place boat and engine in water. Connect electrical harness and fuel line to engine.
2. Pre-set carburetor idle mixture screws at 1¼ turns out from lightly seated position.



a - Maximum Spark Advance Stop Screw

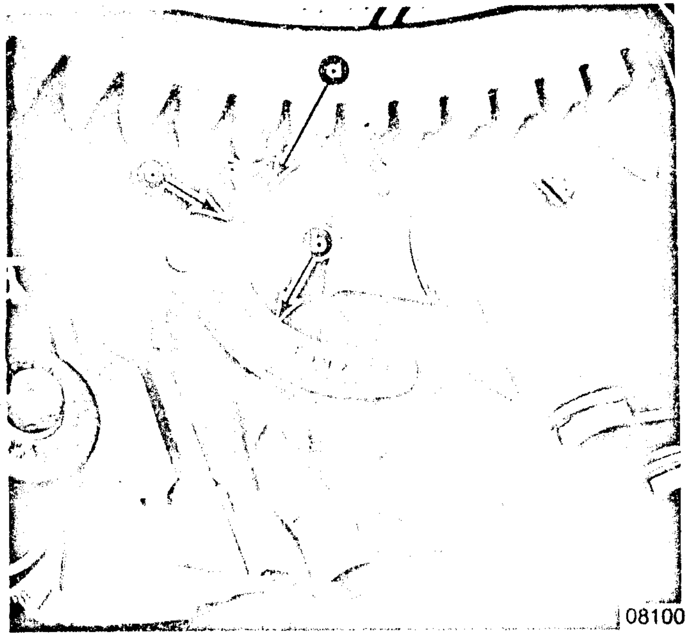
Figure 6. Maximum Spark Advance Adjustment



a - Economizer Spring
b - Secondary Pickup Screw

Figure 7. Secondary Pickup Screw Adjustment

3. Connect Timing Light to No. 1 (top) spark plug.
4. With engine running in forward gear, advance throttle so that throttle primary pickup specification on timing decal is aligned with timing pointer. Then, without moving throttle lever, loosen 2 actuator plates retaining bolts (Figure 4) and rotate actuator plate, as necessary, so that throttle cam just touches primary pickup lever on carburetor cluster, as shown in Figure 5. Retighten retainer bolts.
5. With engine running in forward gear, advance engine speed so that timing pointer is aligned with specified maximum spark advance on timing decal. Adjust maximum spark advance stop screw (Figure 6) so that end of screw just touches distributor adaptor. Retighten nut on adjustment stop screw. Move throttle back to idle and turn off engine. Remove timing light.



a - Secondary Pickup b - Cluster Secondary Lever
c - Just Touching

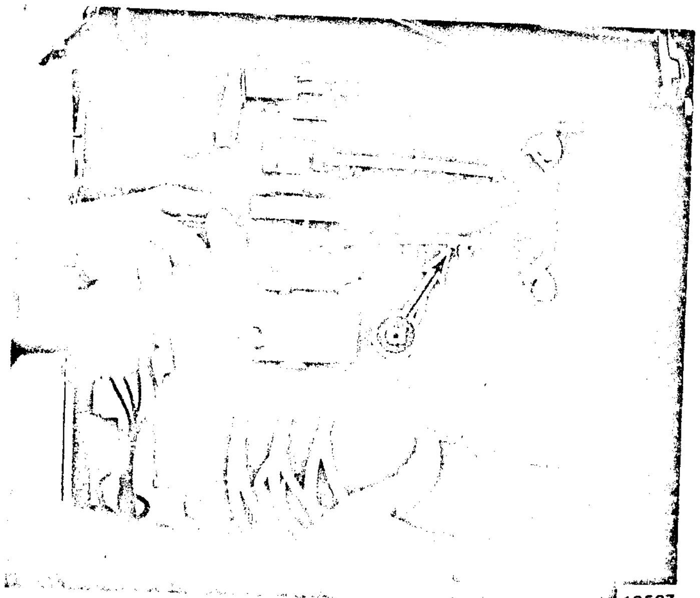
Figure 8. Secondary Pickup Adjustment

6. With engine not running, advance throttle lever so that distributor is against the maximum spark advance screw but not actuating the economizer spring. (Figure 7) Adjust the throttle secondary pickup screw (Figure 7) so that secondary pickup just touches the secondary lever on carburetor, as shown in Figure 8. Retighten nut on adjustment screw.
7. With engine not running, advance throttle lever to wide-open-throttle (WOT) and adjust full throttle stop screw (Figure 9, 10 or 11) to allow full throttle shutter opening at WOT. Make sure that carburetor shutters do not act as a throttle stop. Allow .010" to .015" (.25mm to .38mm) clearance between throttle secondary pickup and secondary lever on carburetor. When throttle is at WOT, retighten nut on adjustment screw.


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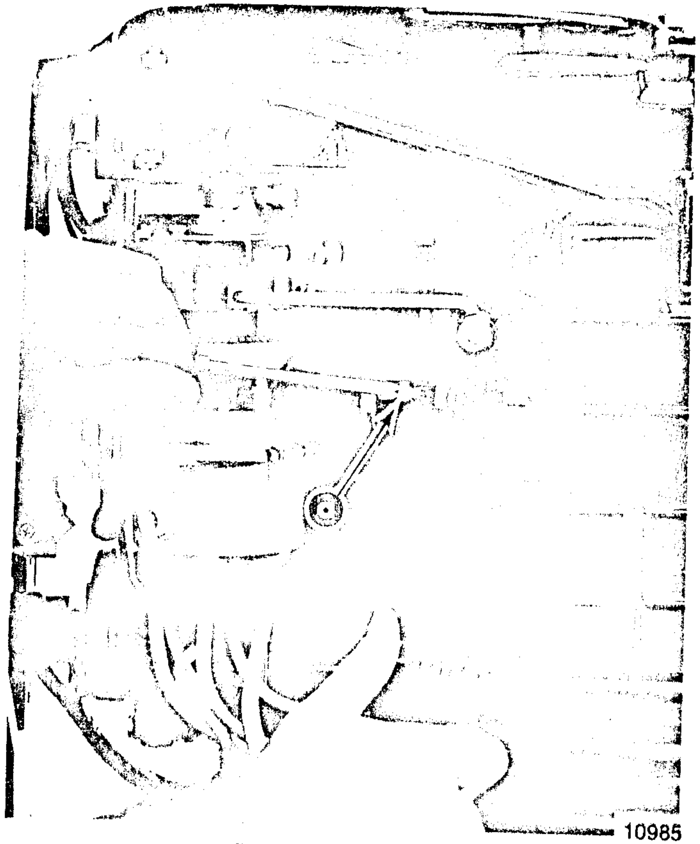
a - Full Throttle Stop Screw

Figure 9. Full Throttle Stop Screw Adjustment (1977 and Older Models)


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a - Full Throttle Stop Screw

Figure 10. Full Throttle Stop Screw Adjustment (1977 and Older Models with Full Throttle Stop Kit Installed)


10985

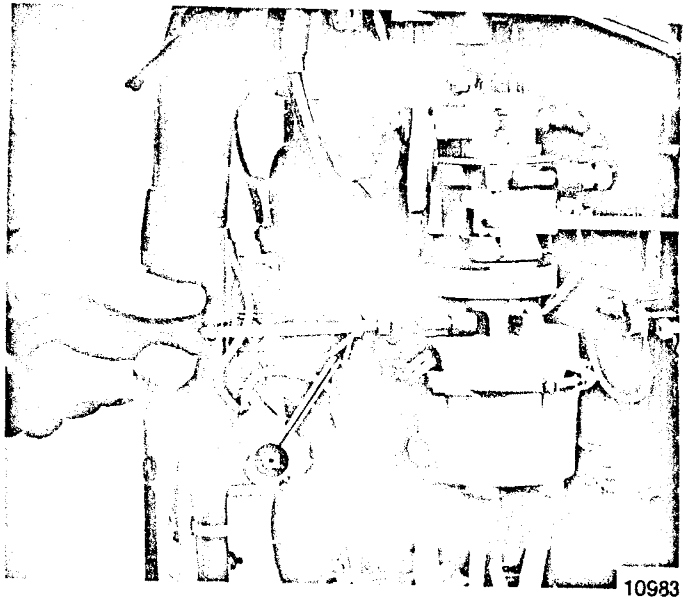
a - Full Throttle Stop Screw

Figure 11. Full Throttle Stop Screw Adjustment (1978 and Newer Models)

CARBURETOR ADJUSTMENTS

1. Start engine and allow engine to warm up in forward gear.
2. Adjust carburetor idle mixture screws to attain best idle in forward gear. See carburetor adjustment information, preceding.
3. Adjust engine idle RPM as follows:
   a. With engine in water, connect electrical harness and fuel line to engine. Start engine and allow to warm up.
   b. With throttle cable barrel removed from barrel retainer, adjust idle RPM to 550-600 RPM with engine running in forward gear. (Figure 12) Retighten nut on adjustment screw.
   c. With end of throttle cable connected to throttle lever, hold throttle lever against idle stop. Adjust throttle cable barrel to slip into barrel retainer on cable anchor bracket with a very light preload of throttle lever against idle stop. Lock barrel in place.
   d. Check preload on throttle cable by placing a thin piece of paper between idle stop screw and idle stop. Preload is correct when paper can be removed without tearing but has some drag on it. Readjust cable barrel, if necessary.

IMPORTANT: Excessive preload on throttle cable will cause difficulty when shifting from forward to neutral. (Readjust throttle cable barrel, if necessary.)



a - Idle RPM Screw

Figure 12. Engine Idle Adjustment

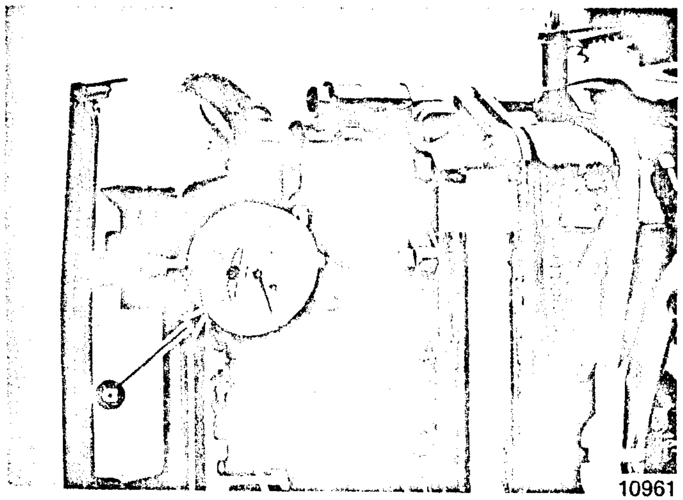
TIMING/SYNCH./ADJUSTING
V-6 Merc 1500-2000 (1978)

	V-6 Merc 1500	V-6 Merc 2000
Firing Order	1-2-3-4-5-6	
Firing Sequence	60° Consecutive	
Spark Plugs	AC-V40FFM or Champion L76V	
Spark Plug Gap	Not Adjustable	
Timing Maximum	16° BTDC	18° BTDC
Throttle Primary Pickup	7.5°-8.5° ATDC	8° to 10° ATDC
Throttle Secondary Pickup	Not Adjustable	
Full Throttle RPM	5000 to 5500	5300 to 5800
Idle RPM (in Forward Gear)	600-700 at 7.5° to 8.5° ATDC	550-650 at 12° to 15° ATDC
Water Pressure	18 to 25 psi @ 5000 RPM	

TIMING POINTER ADJUSTMENT

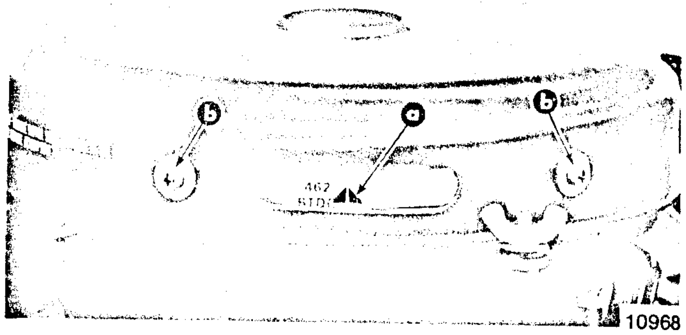
SAFETY WARNING: Engine could start when turning flywheel to check timing pointer adjustment, therefore, remove all spark plugs to prevent engine from starting.

1. Remove all spark plugs and install Dial Indicator (C-91-58222A1) (Figure 1) into No. 1 cylinder (top cylinder, starboard bank).
2. Turn flywheel in a clockwise direction until No. 1 piston is at top dead center (TDC). Set dial indicator at "0" (zero) and tighten indicator set screw.
3. Turn flywheel counterclockwise until dial indicator needle is approx. ¼-turn beyond .462" (12mm), then turn flywheel clockwise so that dial indicator reads .462" exactly.



a - Dial Indicator Installed in No. 1 Cylinder

Figure 1. Dial Indicator Installed in Cylinder



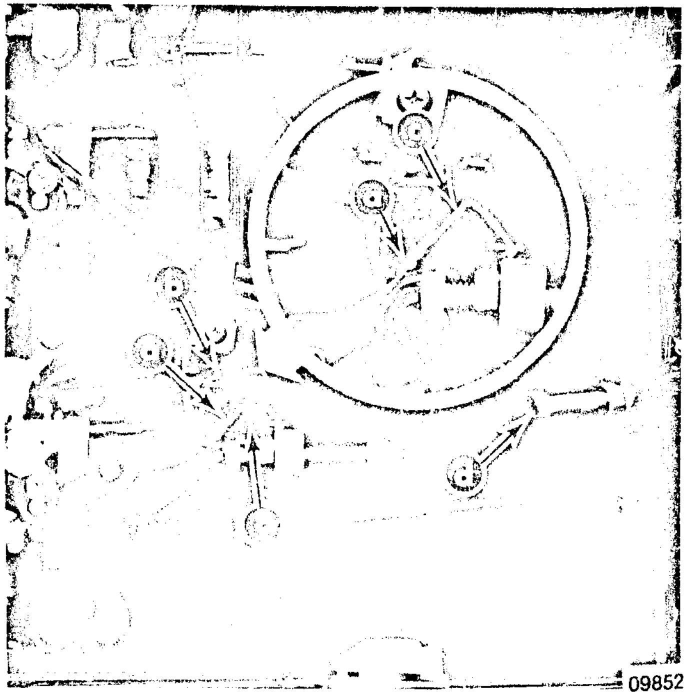
a - Timing Pointer   b - Timing Pointer Attaching Screw

Figure 2. Timing Pointer Alignment

4. Reposition timing pointer, if necessary, so that timing pointer is aligned with .462" mark on timing decal. (Figure 2) Retighten pointer attaching screws.
5. Remove dial indicator from cylinder and reinstall No. 1 spark plug and spark plug lead.

TIMING ADJUSTMENTS

IMPORTANT: If link rod was disassembled, make sure that 11/16" (17.5mm) dimension is retained, as shown in Figure 4.



a - Pickup Alignment Line
b - Reed Block Housing Boss
c - Throttle Cam
d - Idle Stop Screw

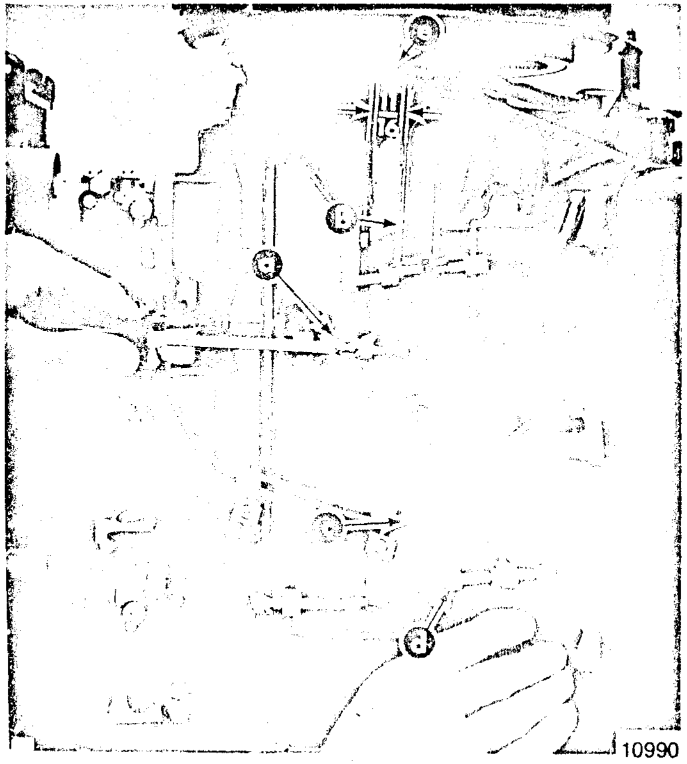
Figure 3. Idle Stop Screw Adjustment

CAUTION: Engine is timed while cranking engine over with starter motor. To prevent engine from starting when being cranked, all spark plugs must be removed, except No. 1 plug.

1. Remove all spark plugs, except No. 1 spark plug (top cylinder, starboard bank), from engine.
2. Disconnect remote fuel line from engine.
3. Connect electrical harness to engine.
4. Remove throttle cable barrel from barrel retainer on cable anchor bracket. Adjust idle stop screw so that top surface of throttle cam is aligned with edge on reed block housing boss, as shown in Figure 3. Do not reinstall throttle cable at this time.
5. Connect Timing Light to No. 1 spark plug (top starboard bank).

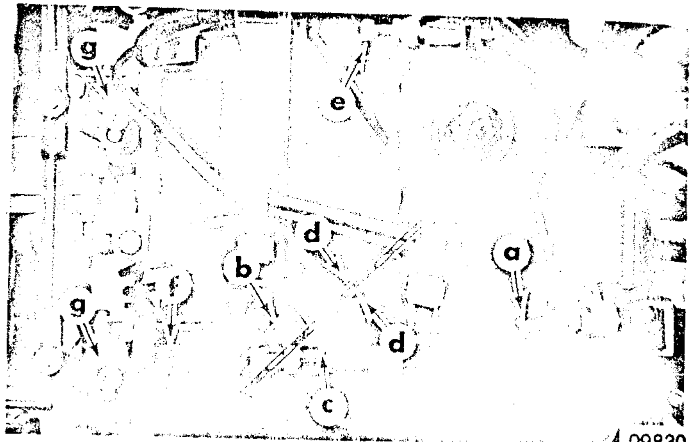
SAFETY WARNING: Before cranking engine, keep clear of propellor, as it may rotate.

6. With engine in neutral, hold throttle arm so that idle stop screw (Figure 4) is against idle stop. Crank engine with starter motor and adjust throttle primary pickup screw (Figure 4) to align specified throttle primary pickup mark on timing decal with timing pointer. Retighten nut on adjustment screw.



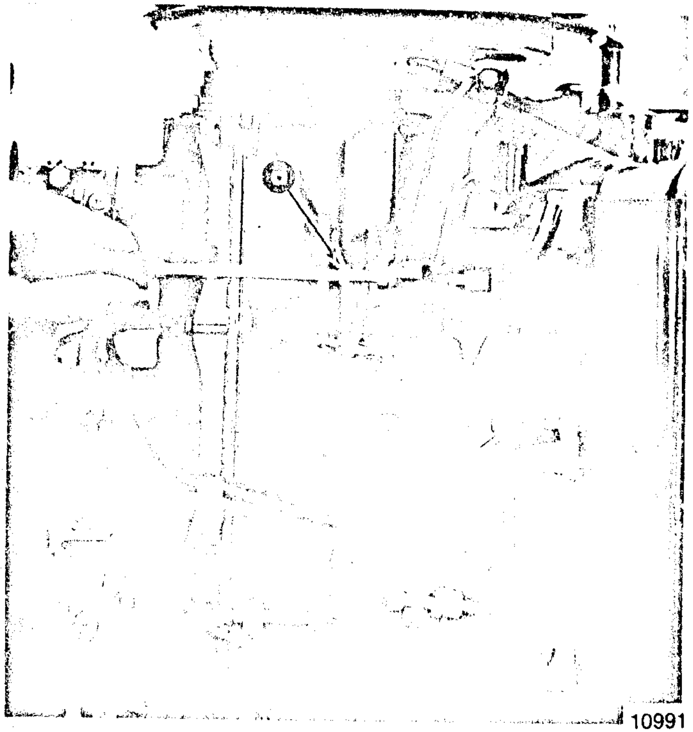
a - Primary Pickup Screw
b - Maximum Spark Advance Lever
c - Throttle Lever
d - Idle Stop Screw (Position against Stop When Adjusting Throttle Primary Pickup)
e - Link Rod

Figure 4. Throttle Primary Pickup Adjustment



a - Idle Stop Screw
b - Throttle Cam
c - Full Throttle Stop Screw Boss
d - 1/8" (3.2mm)
e - Pickup Timing Screw
f - Roller Arm
g - Synchronization Screws (Upper Screw Not in View)

Figure 5. Carburetor Synchronizing



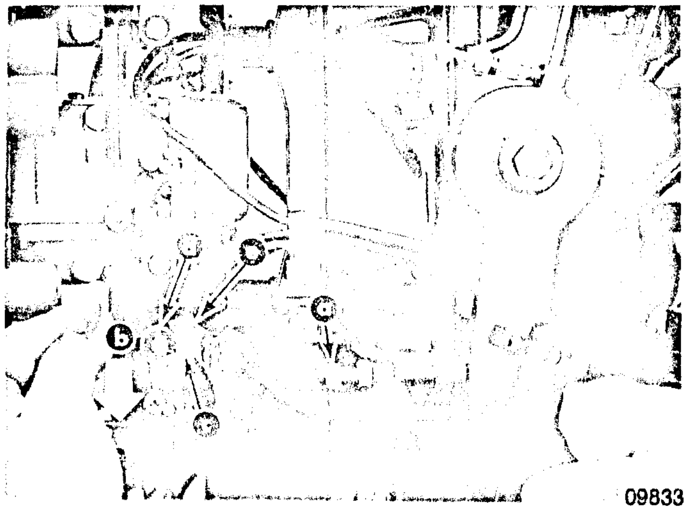
a - Maximum Spark Advance Screw

Figure 6. Maximum Spark Advance Adjustment

7. Loosen 3 carburetor synchronizing screws. (Figure 5) Position throttle lever against idle stop. Move roller arm (Figure 5) until roller just touches throttle cam. Without moving roller arm, retighten 3 carburetor synchronizing screws.

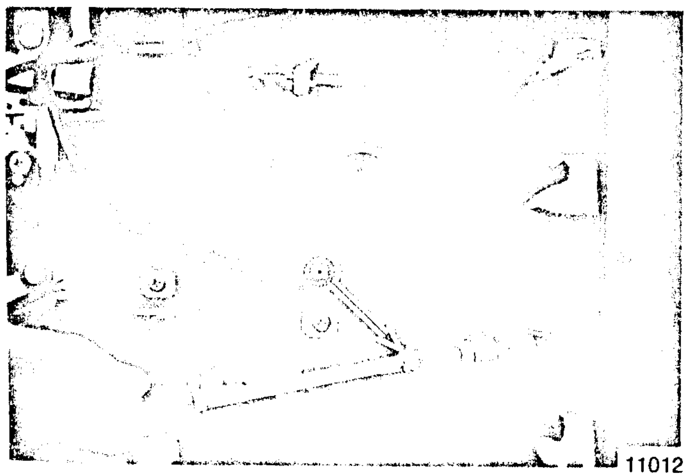
8. With engine in neutral, move throttle lever to place maximum spark screw against stop. Crank engine with starter motor and adjust maximum spark screw (Figure 6) to align 20° (Merc 2000) or 18° (Merc 1500) BTDC mark on timing decal with timing pointer. Because of spark advance characteristics of this ignition system, this adjustment will result in a spark advance of 18° (Merc 2000) or 16° (Merc 1500) at maximum RPM. Retighten nut on adjustment screw. Remove timing light from engine.

9. With engine not running, move throttle lever to wide-open-throttle (WOT) and adjust full throttle stop screw (Figure 7) to allow full throttle shutter opening at WOT. Make sure that throttle shutters do not act as a throttle stop. Allow .010"-.015" (.25mm to .38mm) clearance between roller and throttle cam at WOT, as shown in Figure 7. Retighten nut on adjustment screw.



a - Full Throttle Stop Screw
b - Push Downward
c - .010" to .015" Clearance
d - Roller
e - Throttle Cam

Figure 7. Full Throttle Stop Adjustment



a - Idle Stop Screw

Figure 8. Idle RPM Adjustment

10. Adjust engine idle RPM as follows:
   a. With engine in water, connect electrical harness and fuel line to engine. Start engine and allow to warm up.
   b. With throttle cable barrel removed from barrel retainer, adjust idle RPM to specified idle RPM with engine running in forward gear. (Figure 8) Retighten nut on adjustment screw.
   c. With end of throttle cable connected to throttle lever, hold throttle lever against idle stop. Adjust throttle cable barrel to slip into barrel retainer on cable anchor bracket with a very light preload of throttle lever against idle stop. Lock barrel in place.
   d. Check preload on throttle cable by placing a thin piece of paper between idle stop screw and idle stop. Preload is correct when paper can be removed without tearing but has some drag on it. Readjust cable barrel, if necessary.

IMPORTANT: Excessive preload on throttle cable will cause difficulty when shifting from forward to neutral. (Readjust throttle cable barrel, if necessary.)

NOTE: Carburetor idle mixture is not equipped with adjustment screw, as are other Mercury Outboards. See carburetor jet chart, preceding, for jet change.

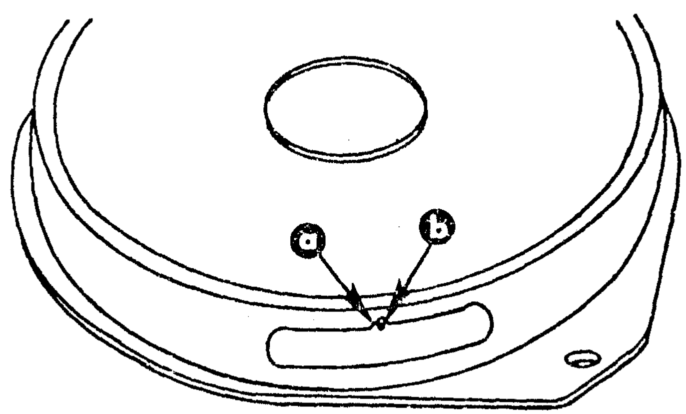
NOTE: If sufficient throttle cable barrel adjustment is not available, a check must be made for correct installation of link rod (located between the throttle lever and throttle cam). Each end of this link rod must be threaded into its plastic barrel until it bottoms against the throttle lever or throttle cam casting, then turned out only far enough to obtain correct orientation of link rod (less than one turn). All timing adjustments must be reset after this procedure.

TIMING/SYNCH./ADJUSTING
V-6 Merc 1750 (1976-77)

Firing Order	1-2-3-4-5-6
Firing Sequence	60° Consecutive
Spark Plug	AC-V40FFM or Champion L76V
Spark Plug Gap	Not Adjustable
Timing Maximum	15° (One Punch Mark) BTDC
Throttle Primary Pickup	8-10° (3 Punch Marks) ATDC
Throttle Secondary Pickup	Not Adjustable
Full Throttle RPM	4800-5800 RPM
Idle RPM	550-650 RPM in Gear
Water Pressure	8 to 11 psi (.56 to .77kg/cm²) @ 3000 RPM

IMPORTANT: Timing procedure has been changed for all Merc 1750 (1976-77) models, as shown in Figure 1 (one punch mark replaces 2 punch marks on flywheel). If timing change has not been made to engine being timed, complete Step 1, following, before timing engine.

1. New timing change (Figure 1)
   a. Remove ALL spark plugs. Install a dial indicator (C-91-58222A1 or equivalent) in No. 1 spark plug hole.
   b. Rotate flywheel until top dead center (TDC) is found and set the dial indicator to zero.
   c. Rotate the flywheel counterclockwise to approximately .100" (2.54mm) before top dead center (BTDC), then rotate the flywheel clockwise until .069" (1.75mm) BTDC is located. (DO NOT locate .069" BTDC by rotating flywheel counterclockwise.)
   d. With a center punch, and using the existing timing reference mark on flywheel cover as a guide, make a new punch mark on flywheel in center of timing mark, as shown in Figure 1.
   e. Remove dial indicator and install spark plug in No. 1 cylinder only.
   f. Remove (or paint over with black paint) the .119" (22°) BTDC timing decal on the front air box cover.



a - Reference Point b - Punch Mark on Flywheel

Figure 1. New Punch Mark on Flywheel

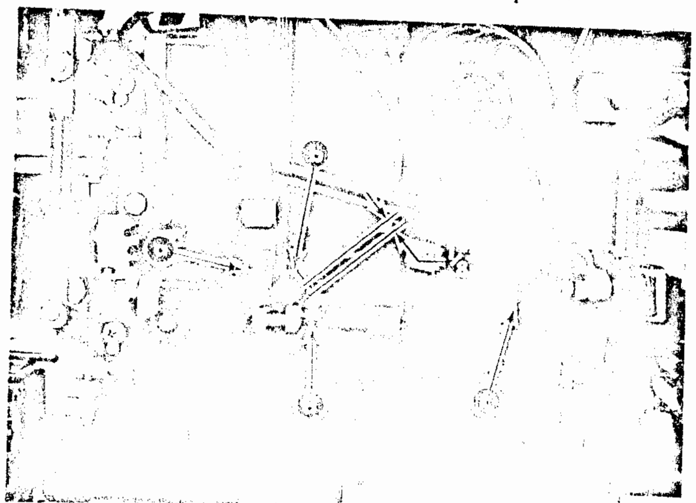
TIMING ADJUSTMENTS

IMPORTANT: If link rod was disassembled, make sure that 11/16" (17.5mm) dimension is retained, as shown in Figure 4.

1. Place engine in test tank or, if engine is mounted on boat, place boat and engine in water.

CAUTION: Engine is timed while cranking engine over with starter motor. To prevent engine from starting when being cranked, all spark plugs must be removed, except No. 1 plug.

2. Remove all spark plugs, except No. 1 plug (top cylinder, starboard bank), from engine.
3. Disconnect remote fuel line from engine.
4. Connect electrical harness to engine.
5. If boss on reed block housing is as shown in Figure 2 (no edge), proceed with Step "a", immediately following. Or, if boss on reed block housing is as shown in Figure 3 (with edge), proceed with Step "b".



10997

a - Reed Block Housing Boss
b - Throttle Cam
c - Idle Stop Screw
d - Throttle Stop Screw Boss

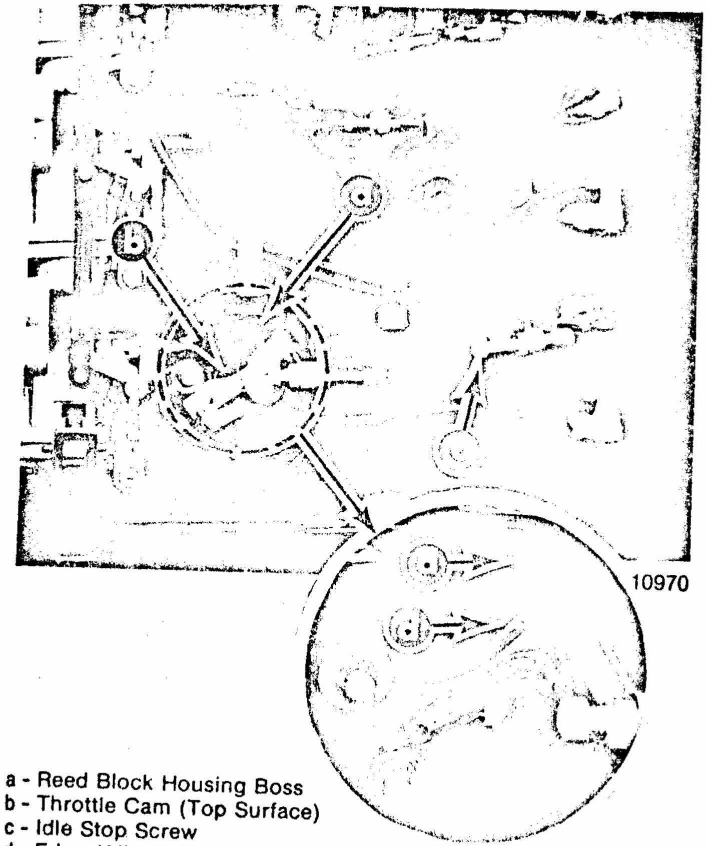
Figure 2. Idle Stop Screw Adjustment

a. Remove throttle cable barrel from barrel retainer on cable anchor bracket. Adjust idle RPM stop screw to align bottom edge of throttle cam to obtain ⅛" (3.2mm) clearance between top front corner of throttle stop screw boss, as shown in Figure 2. Do not reinstall throttle cable at this time.

b. Remove throttle cable barrel from barrel retainer on cable anchor bracket and adjust idle stop screw so that top surface of throttle cam is aligned with edge on reed block housing boss, as shown in Figure 3. Do not reinstall throttle cable at this time.

6. Connect Timing Light to No. 1 spark plug (top, starboard bank).

SAFETY WARNING: Before cranking engine, keep clear of propeller, as it may rotate.



10970

a - Reed Block Housing Boss
b - Throttle Cam (Top Surface)
c - Idle Stop Screw
d - Edge (Align with Top Surface of Throttle Cam)

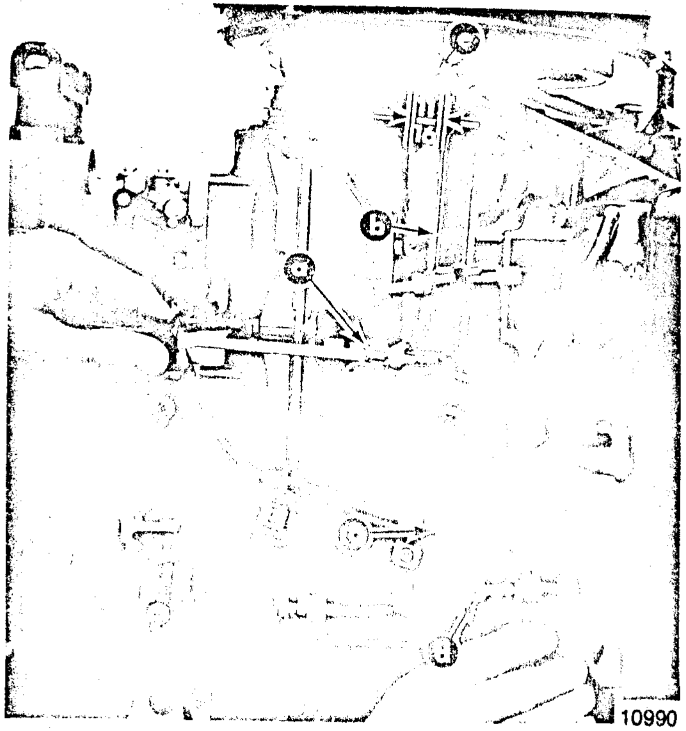
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Figure 3. Idle Stop Screw Adjustment

7. With engine in neutral, hold throttle so that idle stop screw (Figure 4) is against idle stop. Crank engine with starter motor and adjust throttle primary pickup screw (Figure 4) to align 3 punch marks on flywheel with notch in window of flywheel cover. Retighten nut on adjustment screw.
8. Loosen 3 carburetor synchronizing screws. (Figure 5) Position throttle lever against idle stop. Move roller arm (Figure 5) until roller just touches throttle cam. Without moving arm, retighten 3 carburetor synchronizing screws.

NOTE: Timing mark (2 punch marks) on flywheel is no longer used.

9. With engine in neutral, move throttle lever to place maximum spark screw against stop. Crank engine with starter motor and adjust maximum spark screw (Figure 6) to align one punch mark on flywheel with notch in window of flywheel cover. (Figure 1) Because of spark advance characteristics of this ignition system, this adjustment will result in a spark advance of 15° at maximum RPM. Retighten nut on adjustment screw. Remove timing light from engine.



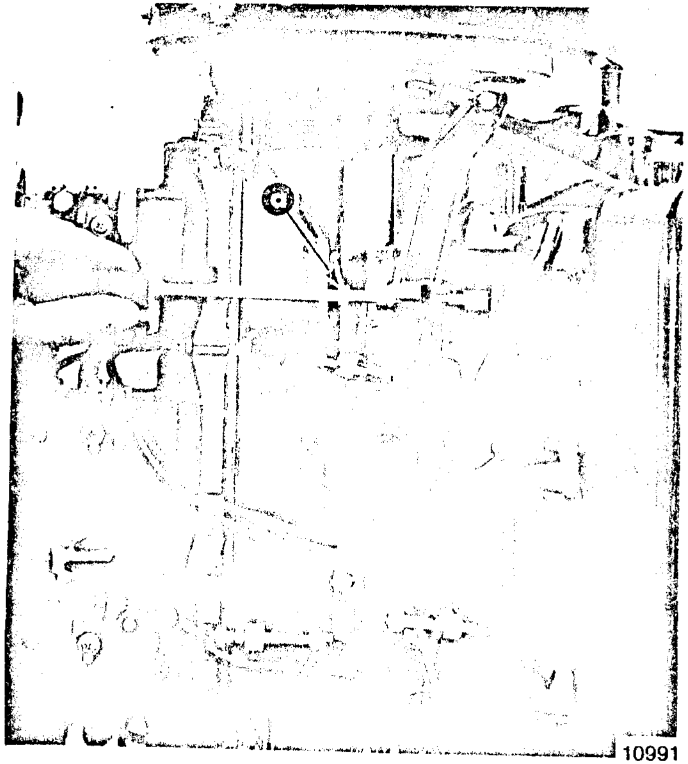
a - Primary Pickup Screw
b - Maximum Spark Advance
c - Throttle Lever
d - Idle Stop Screw (Position against Stop When Adjusting Primary Pickup)
e - Link Rod

Figure 4. Throttle Primary Pickup Adjustment



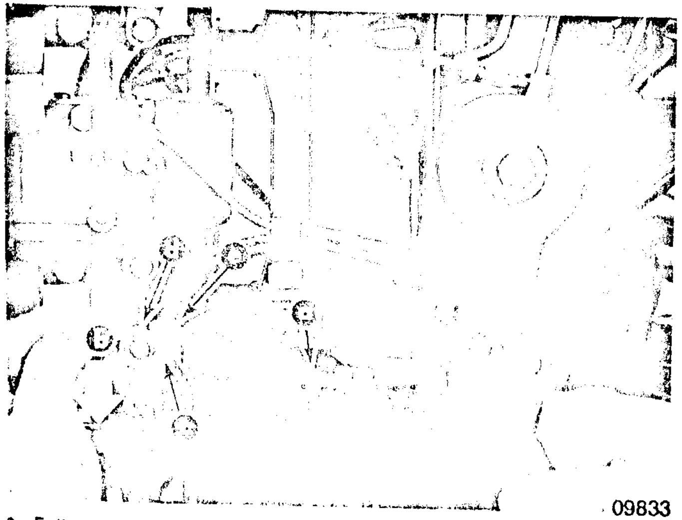
a - Synchronizing Screw
b - Roller
c - Idle Stop Screw (Against Stop)
d - Just Touching

Figure 5. Carburetor Synchronizing



a - Maximum Spark Advance Screw

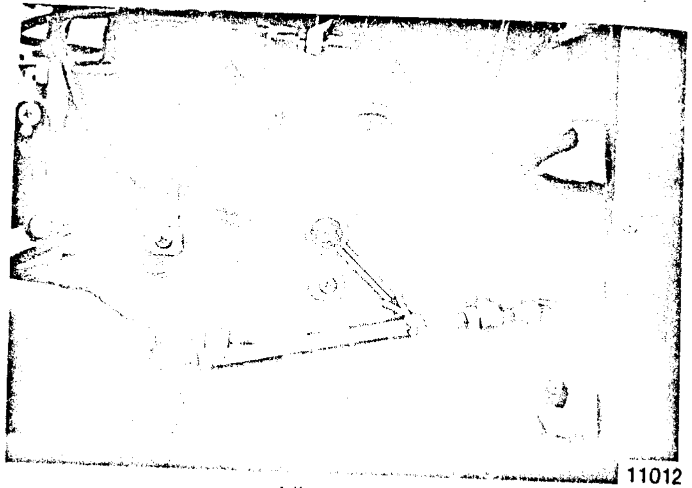
Figure 6. Maximum Spark Advance Adjustment



a - Full Throttle Stop Screw
b - Push Downward
c - .010" to .015" Clearance
d - Roller
e - Throttle Cam

Figure 7. Full Throttle Stop Adjustment

10. With engine not running, move throttle lever to wide-open-throttle (WOT) and adjust full throttle stop screw (Figure 7) to allow full throttle shutter opening at WOT. Make sure that throttle shutters do not act as a throttle stop. Allow .010"-.015" (.25mm to .38mm) clearance between roller and throttle cam at WOT, as shown in Figure 7. Retighten nut on adjustment screw.



a - Idle Stop Screw

Figure 8. Idle RPM Adjustment

11. Adjust engine idle RPM as follows:
   a. With engine in water, connect electrical harness and fuel line to engine. Start engine and allow to warm up.
   b. With throttle cable barrel removed from barrel retainer, adjust idle RPM to 550-650 RPM with engine running in forward gear. (Figure 8) Retighten nut on adjustment screw.
   c. With end of throttle cable connected to throttle lever, hold throttle lever against idle stop. Adjust throttle cable barrel to slip into barrel retainer on cable anchor bracket with a very light preload of throttle lever against idle stop. Lock barrel in place.
   d. Check preload on throttle cable by placing a thin piece of paper between idle stop screw and idle stop. Preload is correct when paper can be removed without tearing but has some drag on it. Readjust cable barrel, if necessary.

IMPORTANT: Excessive preload on throttle cable will cause difficulty when shifting from forward to neutral. (Readjust throttle cable barrel, if necessary.)

NOTE: Carburetor idle mixture is not equipped with adjustment screw, as are other Mercury Outboards. See carburetor jet chart, preceding, for jet change.

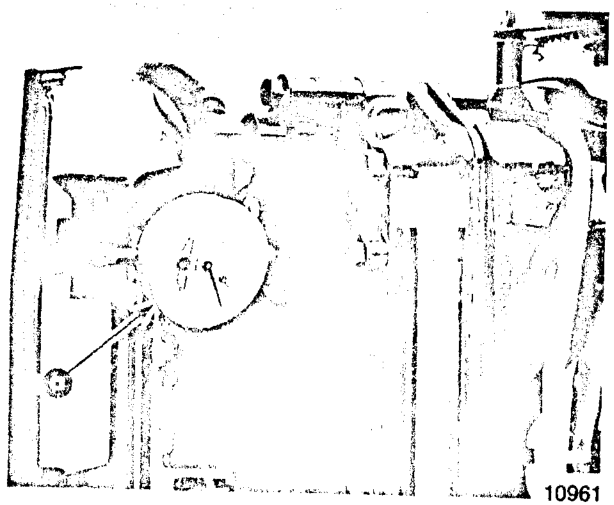
TIMING/SYNCH./ADJUSTING
V-6 Merc 1750 (1978)

Firing Order	1-2-3-4-5-6
Firing Sequence	60° Consecutive
Spark Plug	AC-V40FFM or Champion L76V
Spark Plug Gap	Not Adjustable
Timing Maximum	18° BTDC (20° at Cranking Speed)
Throttle Primary Pickup	14° ATDC
Full Throttle RPM	5300-5800 RPM
Idle RPM (in Gear)	600-700 RPM
Water Pressure	18 to 25 psi @ 5000 RPM

TIMING POINTER ADJUSTMENT

SAFETY WARNING: Engine could start when turning flywheel to check timing pointer adjustment. Remove all spark plugs from engine to prevent engine from starting.

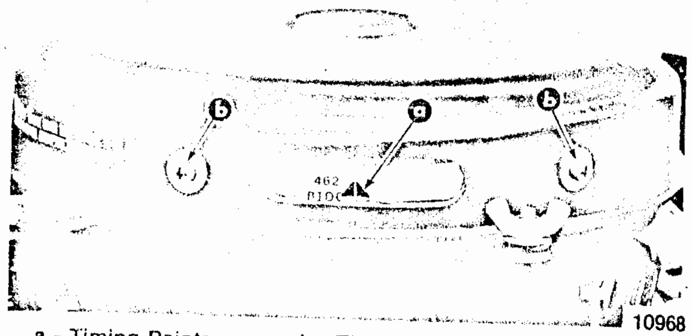
1. Remove all spark plugs and install Dial Indicator (C-91-58222A1) (Figure 1) into No. 1 cylinder (top cylinder, starboard bank).
2. Turn flywheel in a clockwise direction until No. 1 piston is at top dead center (TDC). Set dial indicator at "0" (zero) and tighten indicator set screw.



a - Dial Indicator Installed in No. 1 Cylinder

Figure 1. Dial Indicator Installed in Cylinder

3. Turn flywheel counterclockwise until dial indicator needle is approximately ¼-turn past .462", then turn flywheel clockwise so that dial indicator reads .462" exactly.
4. Reposition timing pointer (if necessary) so that timing pointer is aligned with .462" mark on timing decal, as shown in Figure 2. Retighten pointer attaching screws.
5. Remove dial indicator from cylinder and reinstall No. 1 spark plug and spark plug lead for timing.



a - Timing Pointer b - Timing Pointer Attaching Screw

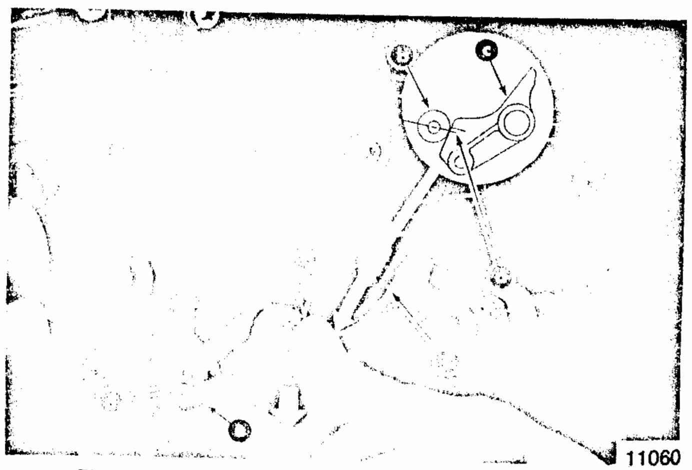
Figure 2. Timing Pointer Alignment

TIMING ADJUSTMENTS

IMPORTANT: If link rod (Figure 4) was disassembled, make sure that 11/16" (17.5mm) dimension is retained, as shown in Figure 4.

> **CAUTION: Engine is timed while cranking engine with starter motor. To prevent engine from starting when being cranked, all spark plugs must be removed, except No. 1 spark plug.**

1. Remove all spark plugs, except No. 1 plug (top cylinder, starboard bank) from engine.
2. Disconnect remote fuel line from engine.
3. Connect electrical harness to engine.
4. Remove throttle cable barrel from barrel retainer on cable anchor bracket.
5. Adjust throttle cam and carburetor synchronization, as follows:

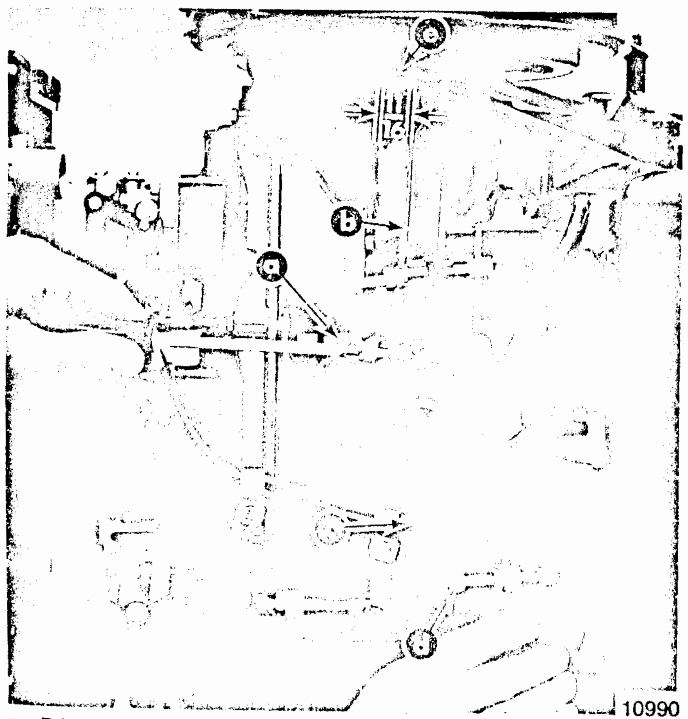


a - First Slash Mark
b - Roller
c - Cam Follower
d - Carburetor Synchronizing Screw (One Each Carburetor)
e - Push Up on Throttle Shaft (Removes Looseness)
f - Push Down on Roller (Removes Looseness)

Figure 3. Adjusting Throttle Cam

a. Remove choke knob and wing nuts and remove sound box cover from engine. This is necessary to be sure that all carburetor throttle shutters are closed and that they will open together.
b. Loosen carburetor synchronizing screws (Figure 3) and allow all throttle shutters to close freely.
c. Lightly press cam follower roller against throttle cam and, at the same time, lift up on bottom carburetor throttle shaft, as shown in Figure 3. This must be done to remove looseness in the linkage components.
d. Adjust idle stop screw (Figure 3) so that first (short) slash mark on throttle cam is at the point of contact with roller, as shown in Figure 3. Retighten nut on idle adjustment screw.
e. While still maintaining slight pressure against roller and lifting up bottom throttle shaft, retighten all carburetor synchronizing screws. CHECK that carburetor throttle shutters are completely closed when roller is at point of contact with first slash (short) mark on throttle cam and all looseness is removed from linkage so that carburetor shutter plates will start to open exactly at the same time that throttle lever is actuated.

IMPORTANT: Actuate throttle and spark levers a few times, then return throttle lever to idle stop. Check that roller is at point of contact with first slash mark on throttle cam, that all carburetor throttle shutters are completely closed and that all looseness is removed so that carburetor throttle shutters will start to open exactly at the same time that throttle lever is actuated (readjust if necessary).



a - Primary Pickup Screw
b - Maximum Spark Advance Lever
c - Throttle Lever
d - Idle Stop Screw (Position against Stop When Adjusting Primary Pickup)
e - Link Rod

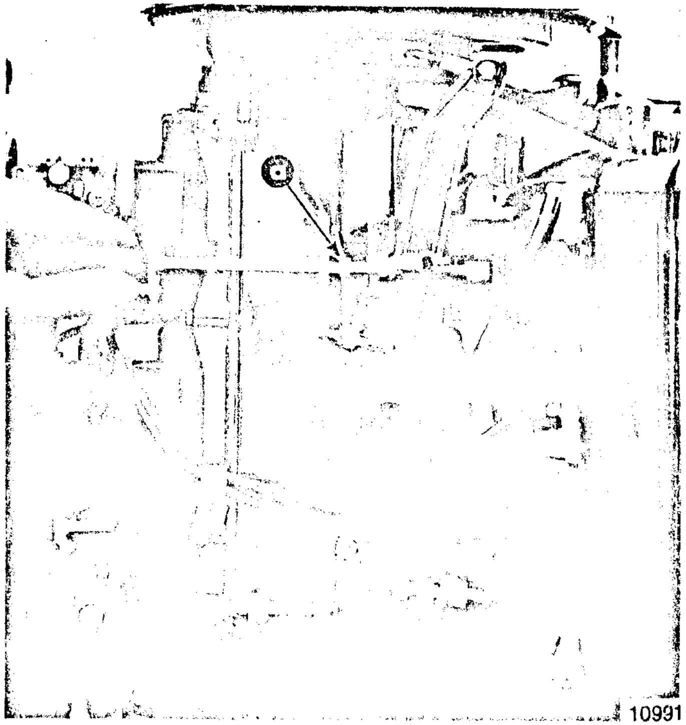
Figure 4. Throttle Primary Pickup Adjustment

f. Reinstall sound box cover to engine.

6. Connect timing light to No. 1 spark plug (top starboard bank).

SAFETY WARNING: Before cranking engine, keep clear of propeller, as it may rotate.

7. With engine in neutral, hold throttle so that idle stop screw (Figure 4) is against idle stop, then crank engine with starter motor and adjust throttle primary pickup screw (Figure 4) to align 14° ATDC mark on timing decal with timing pointer. Retighten nut on adjustment screw.
8. With engine in neutral, move throttle lever to place maximum spark screw against stop. Crank engine with starter motor and adjust maximum spark screw (Figure 5) to align 20° BTDC mark on timing decal with the pointer. Due to the advance characteristics of this ignition system, this adjustment will result in a spark advance of 18° at maximum RPM. Retighten nut on adjustment screw. Remove timing light from engine.



a - Maximum Spark Advance Screw

Figure 5. Maximum Spark Advance Adjustment

9. With engine not running, move throttle lever to wide-open-throttle (WOT) and adjust full throttle stop screw (Figure 6) to allow full throttle shutter opening at WOT. Make sure that throttle shutters do not act as a throttle stop. Allow .010"-.015" (0.25mm to 0.38mm) clearance between roller and throttle cam at WOT, as shown in Figure 6. Retighten nut on adjustment screw.
10. Adjust engine idle RPM as follows:
    a. With engine in water, connect electrical harness and fuel line to engine. Start engine and allow to warm up.



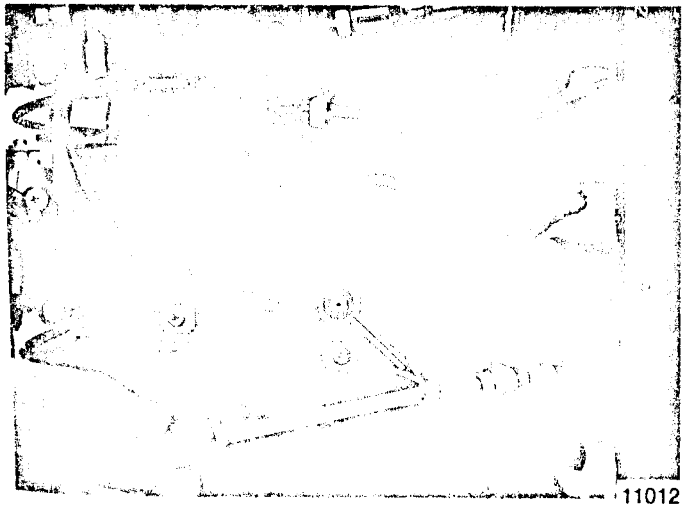
a - Full Throttle Stop Screw
b - Push Downward
c - .010" to .015" Clearance
d - Roller
e - Throttle Cam

Figure 6. Full Throttle Stop Adjustment

b. With throttle cable barrel removed from barrel retainer, adjust idle RPM to 600-700 RPM with engine running in forward gear. (Figure 7) Retighten nut on adjustment screw.

c. With end of throttle cable connected to throttle lever, hold throttle lever against idle stop. Adjust throttle cable barrel to slip into barrel retainer on cable anchor bracket with a very light preload of throttle lever against idle stop. Lock barrel in place.

d. Check preload on throttle cable by placing a thin piece of paper between idle stop screw and idle stop. Preload is correct when paper can be removed without tearing but has some drag on it. Readjust cable barrel, if necessary.



a - Idle Stop Screw

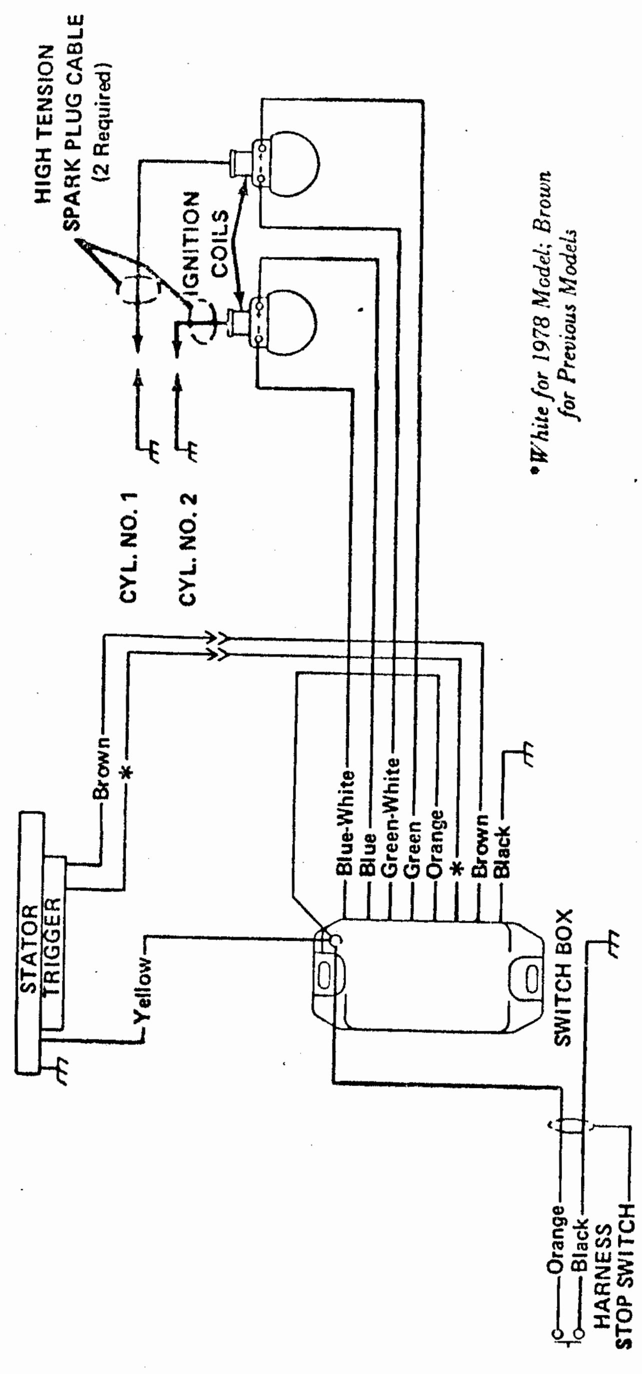
Figure 7. Idle RPM Adjustment

IMPORTANT: Excessive preload on throttle cable will cause difficulty when shifting from forward to neutral. (Readjust throttle cable barrel, if necessary.)

NOTE: Carburetor idle mixture is not equipped with adjustment screw, as are other Mercury Outboards. See carburetor jet chart, preceding, for jet change.

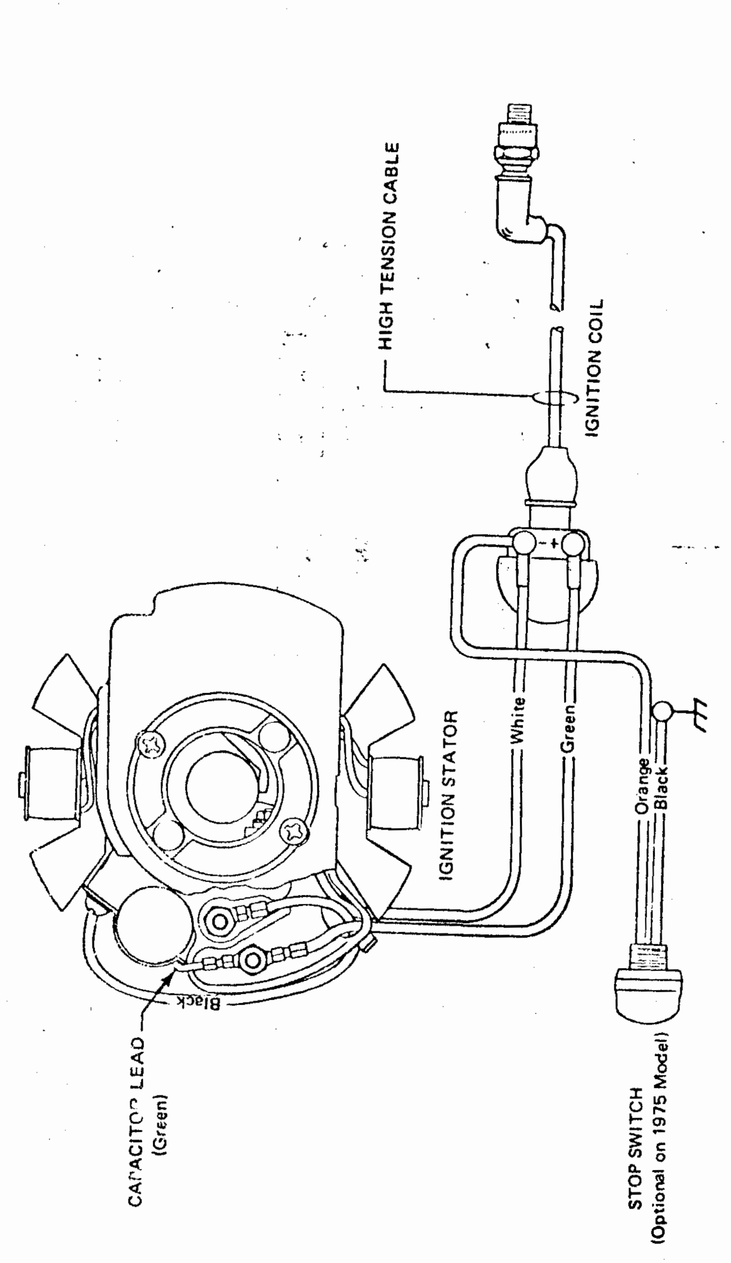
NOTE: If sufficient throttle cable barrel adjustment is not available, a check must be made for correct installation of link rod (located between the throttle lever and throttle cam). Each end of this link rod must be threaded into its plastic barrel until it bottoms against the throttle lever or throttle cam casting, then turned out only far enough to obtain correct orientation of link rod (less than one turn). All timing adjustments must be reset after this procedure.

MERC 40 (2-CYL.) MANUAL START

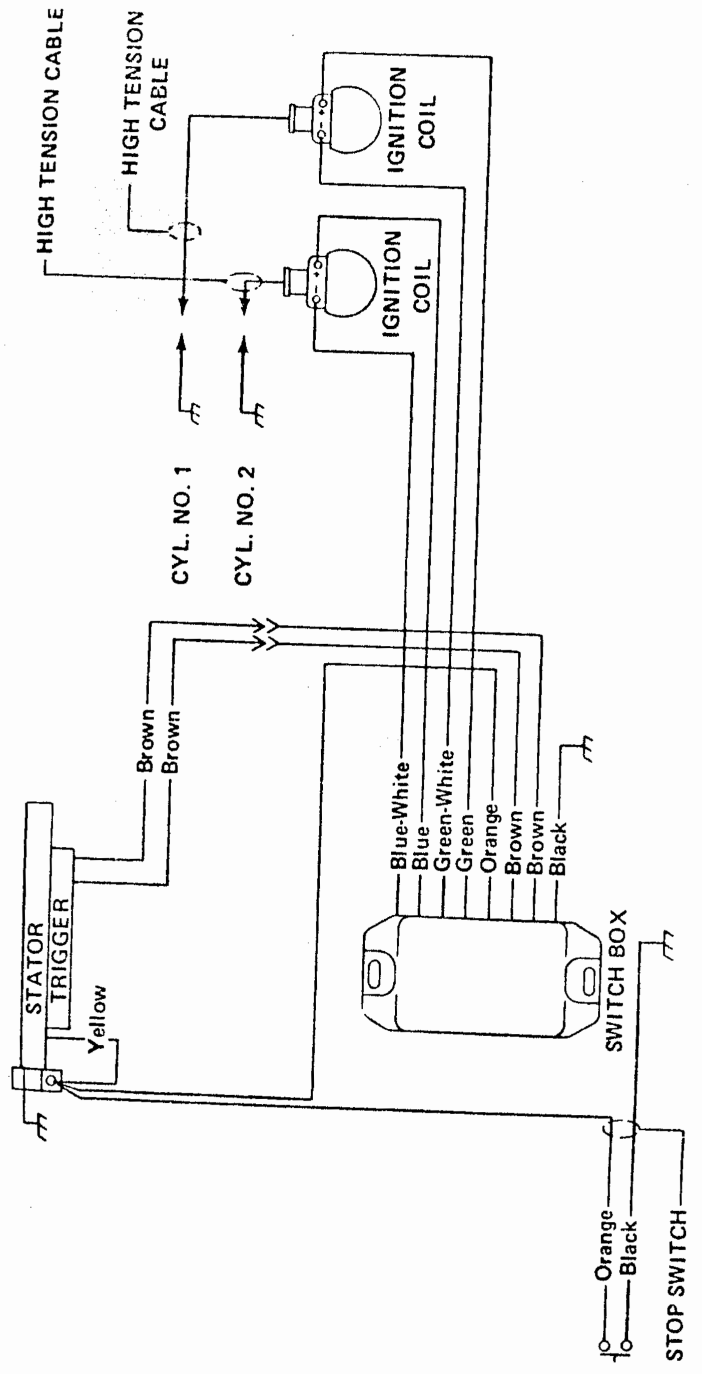


White for 1978 Model; Brown for Previous Models

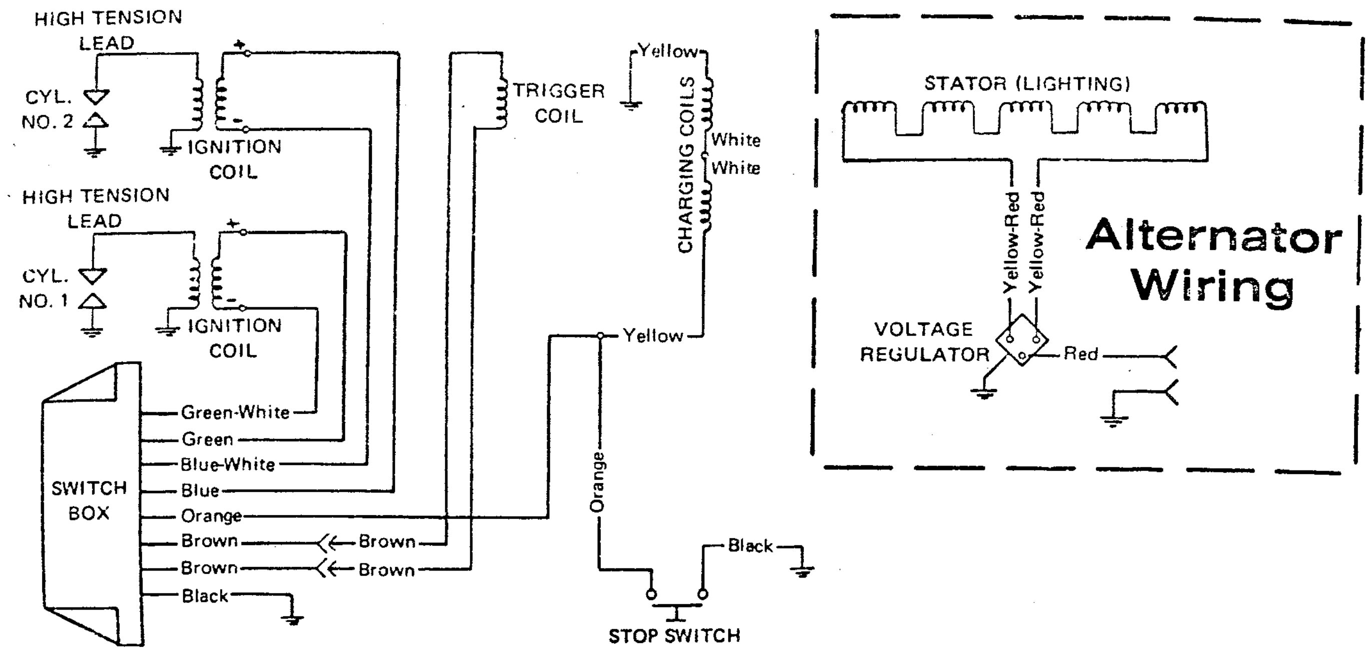
MERC 45 (1975-76-77-78) MANUAL START



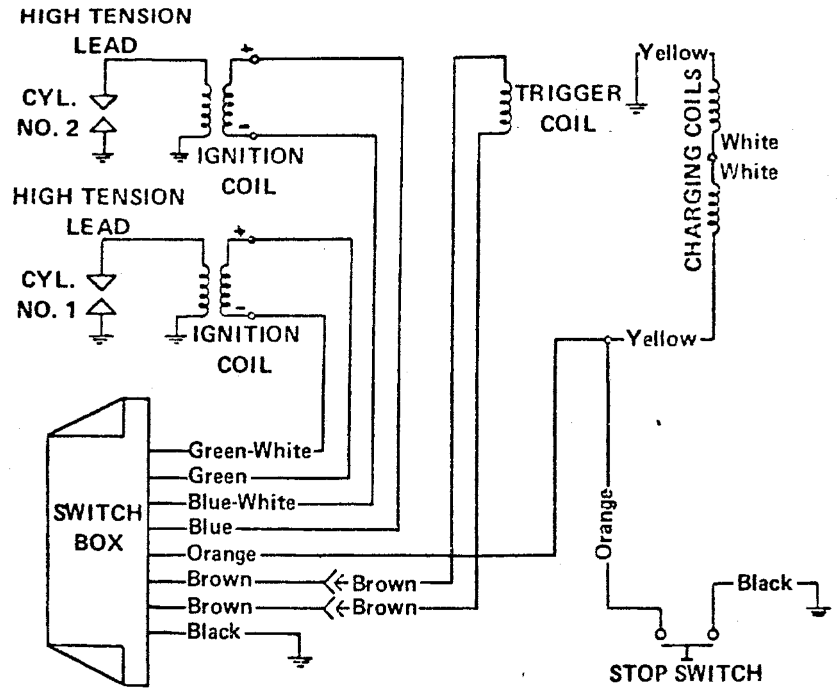
MERC 75 and 110 (1975) MANUAL START



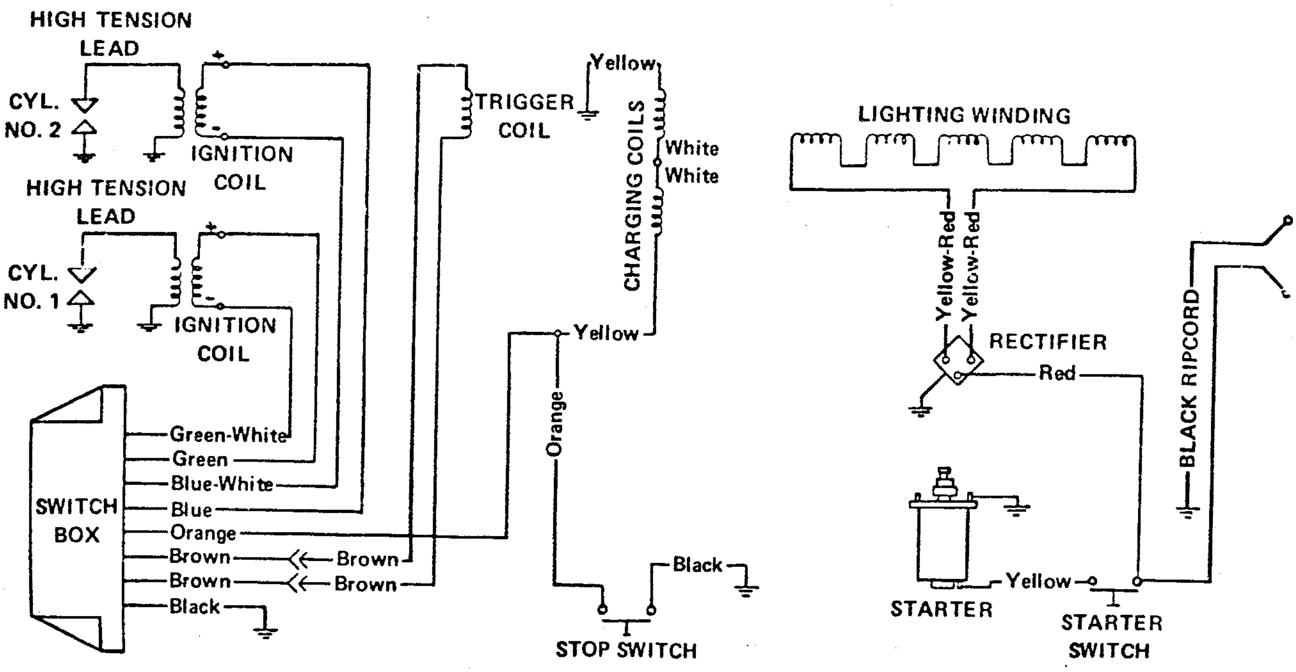
MERC 75 and 110 (1976-77-78) MANUAL START with ALTERNATOR



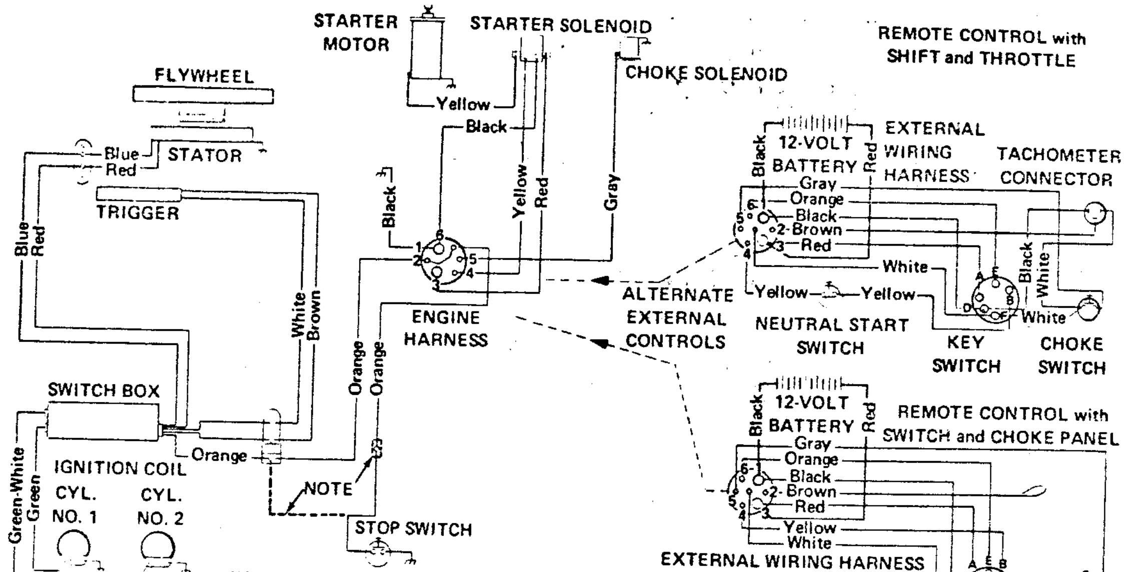
MERC 75-110 (1976-77-78) MANUAL START



MERC 75-110 (1976-77-78) ELECTRIC START

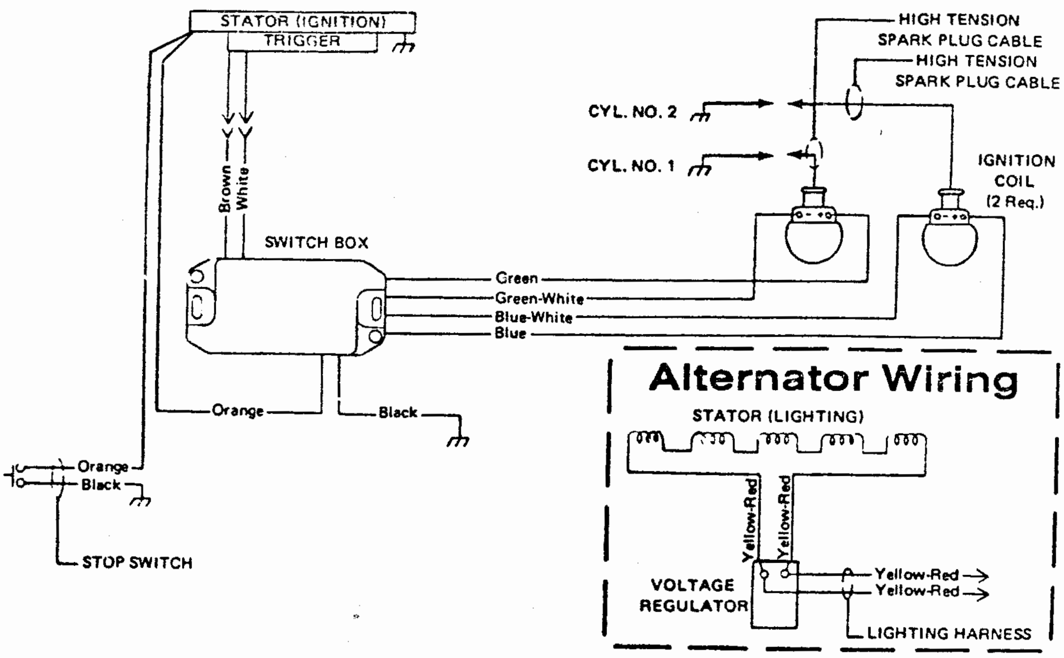


MERC 200 (1975) ELECTRIC START

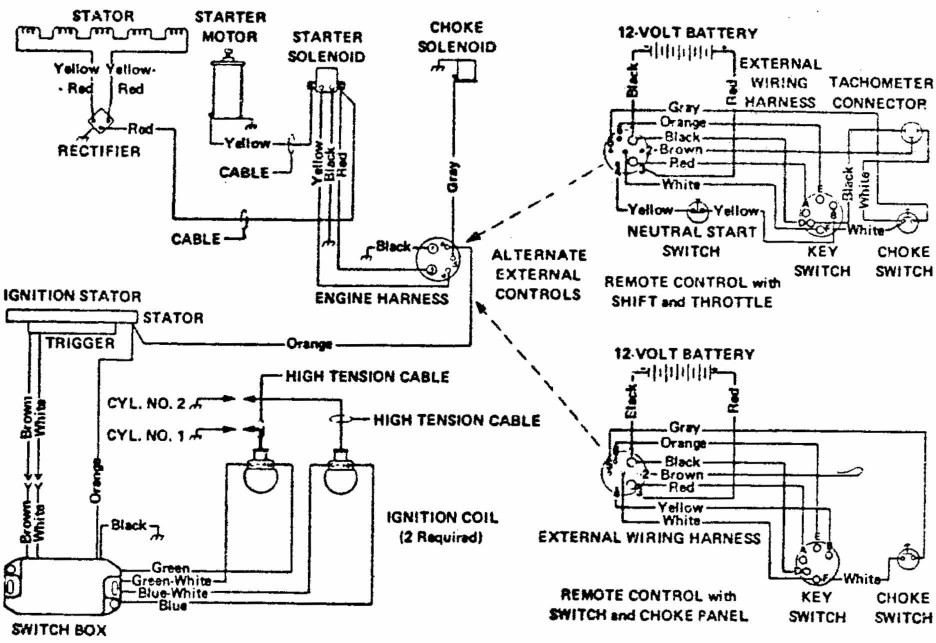


NOTE: When Electric Starter Kit Is Installed, Disconnect Stop Switch Orange Lead from Terminal Block. Install Neoprene Sleeve over End of Lead and Connect Lead to Short Orange Lead in Engine Harness, Using Screw and Nut Provided. Slide Neoprene Sleeve over Connection. Remove Boot from Orange Lead in Harness and Connect to Terminal Block.

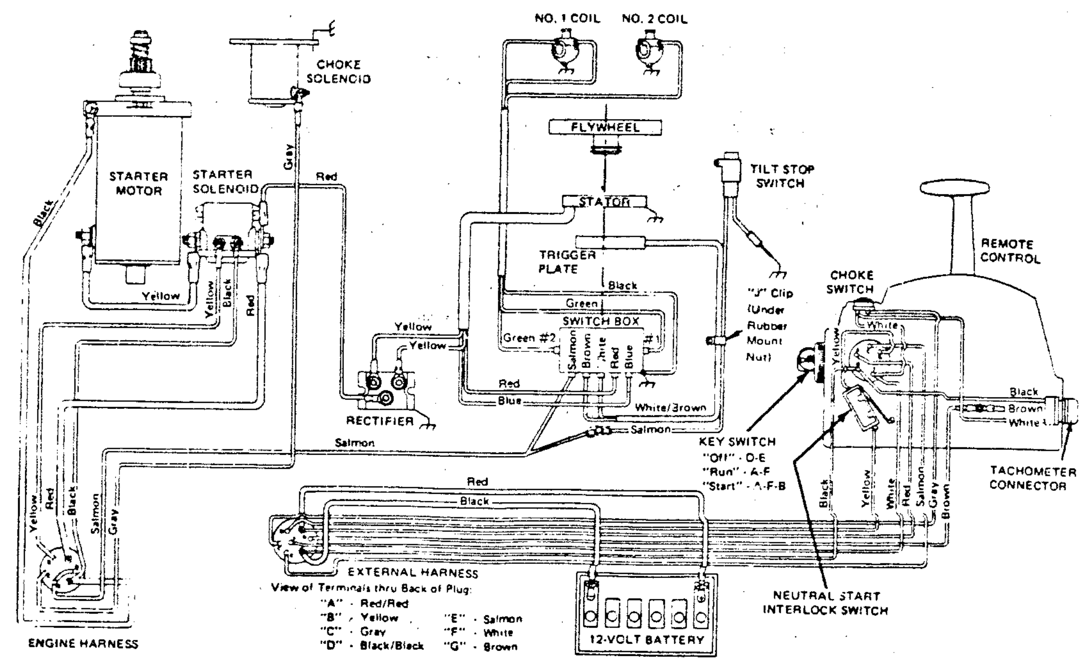
MERC 200 (1976-77-78) MANUAL START with ALTERNATOR



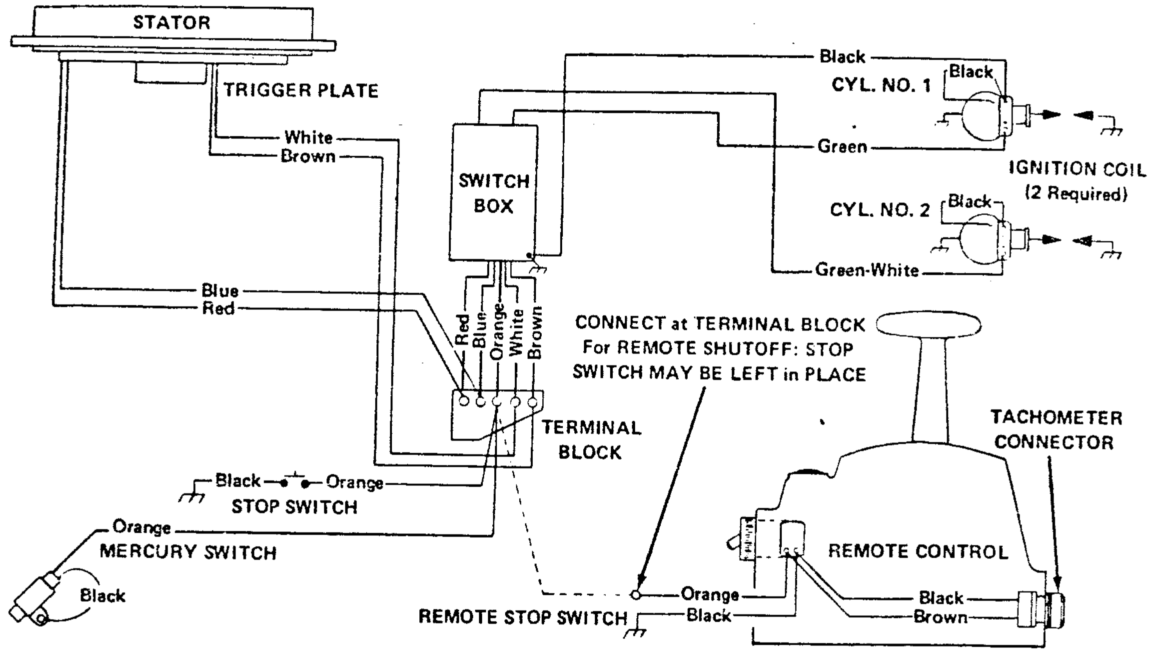
MERC 200 (1976-77-78) ELECTRIC START



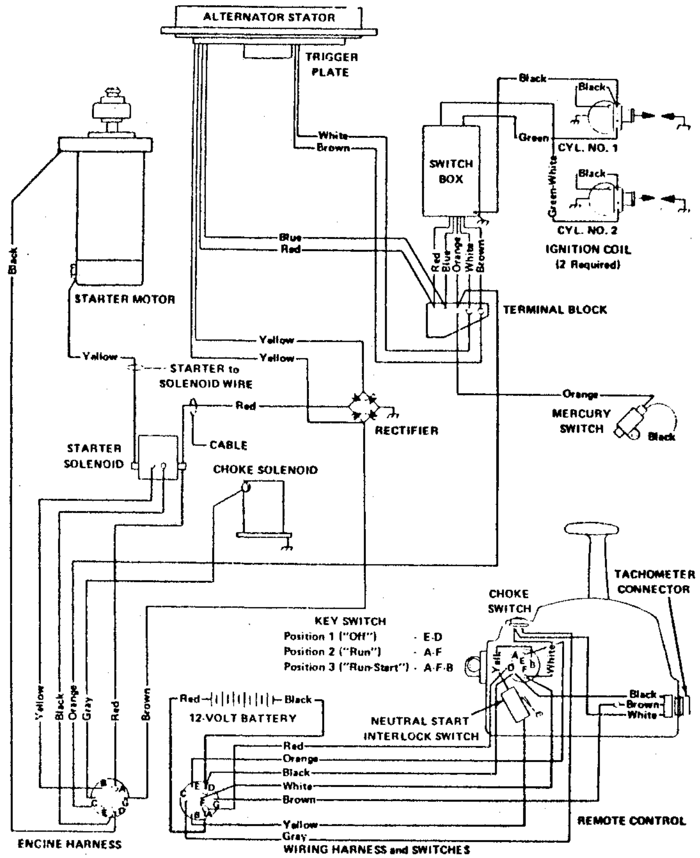
MERC 402 (1975) ELECTRIC START



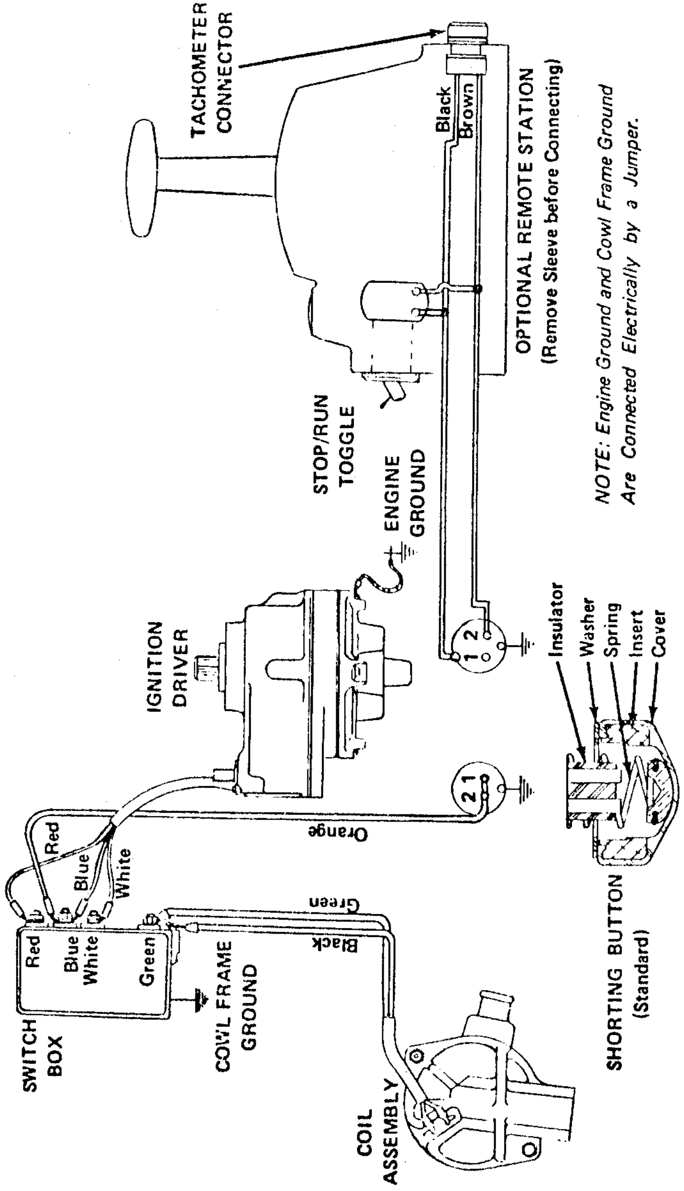
MERC 402 (1976-77-78) MANUAL START



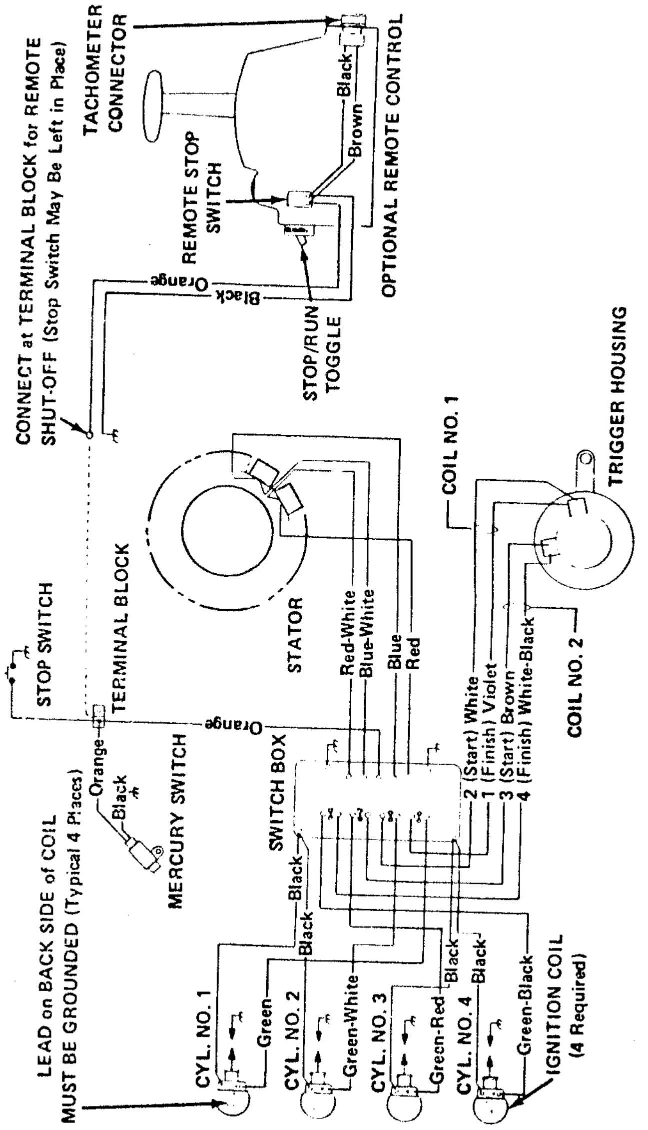
MERC 402 (1976-77-78) ELECTRIC START



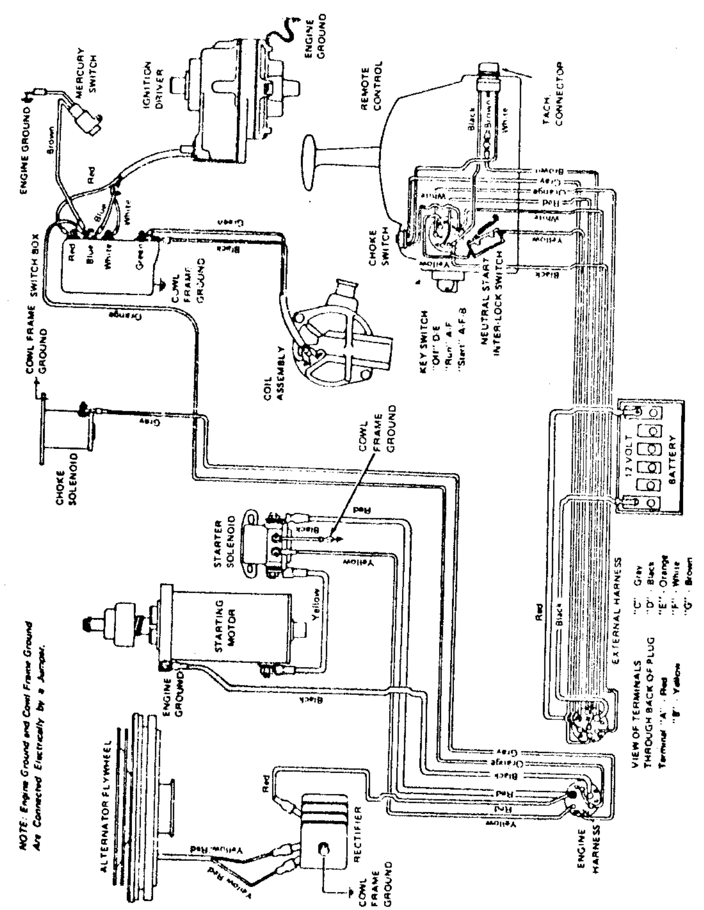
MERC 500 (1975) MANUAL START



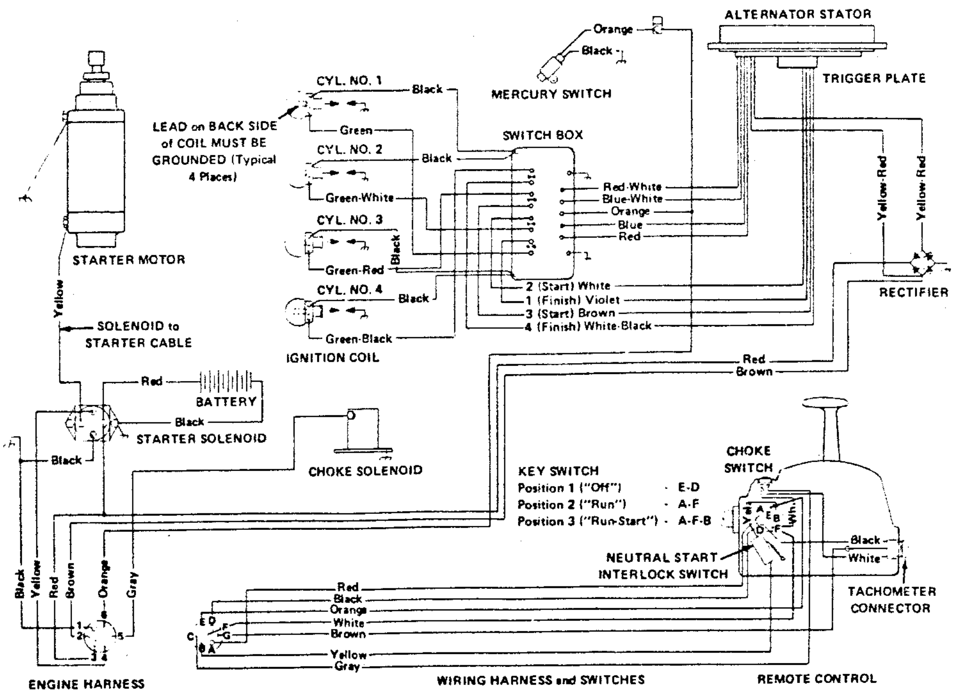
MERC 500 (1976-77-78) MANUAL START



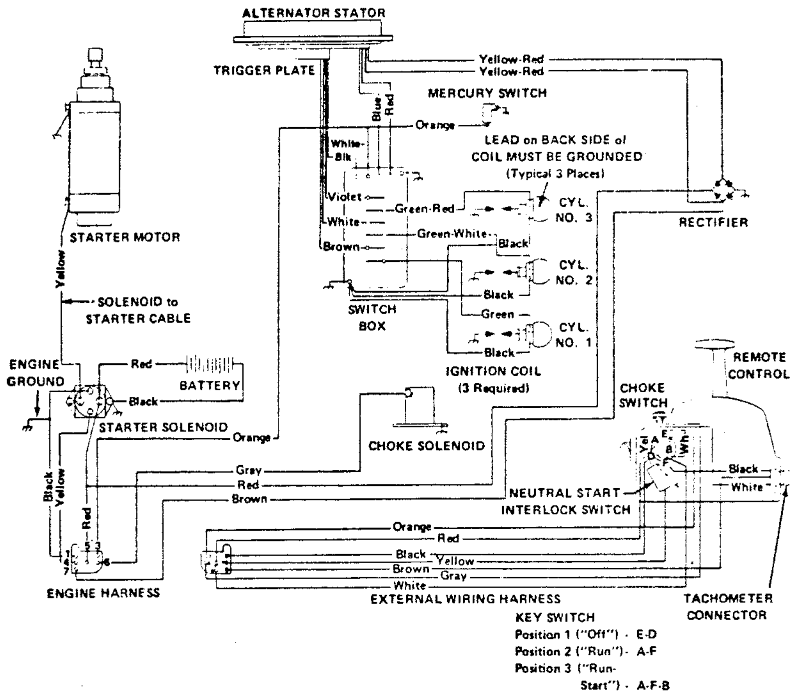
MERC 500 (1975) ELECTRIC START AD-CD IGNITION

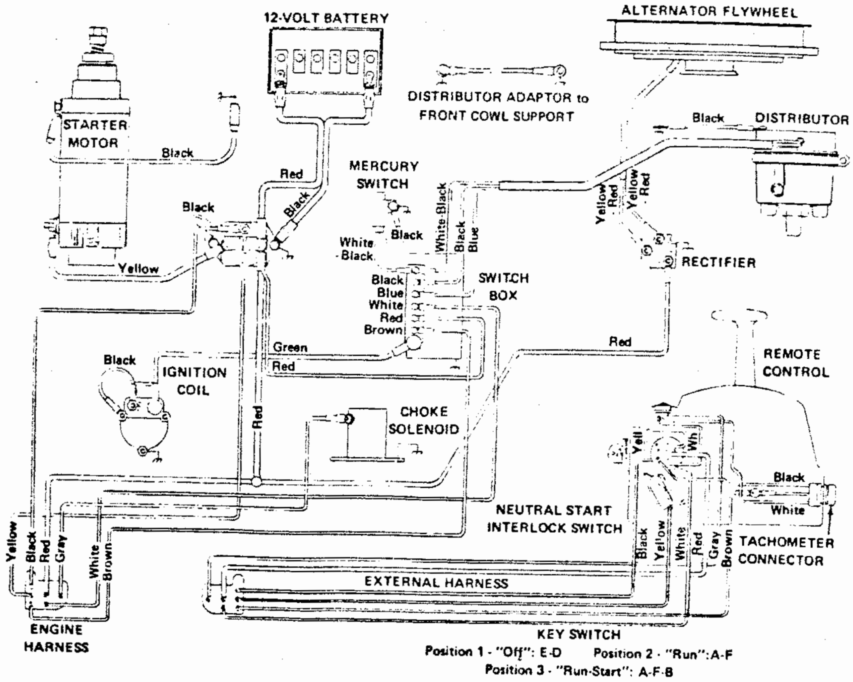


MERC 500 (1976-77-78) ELECTRIC START

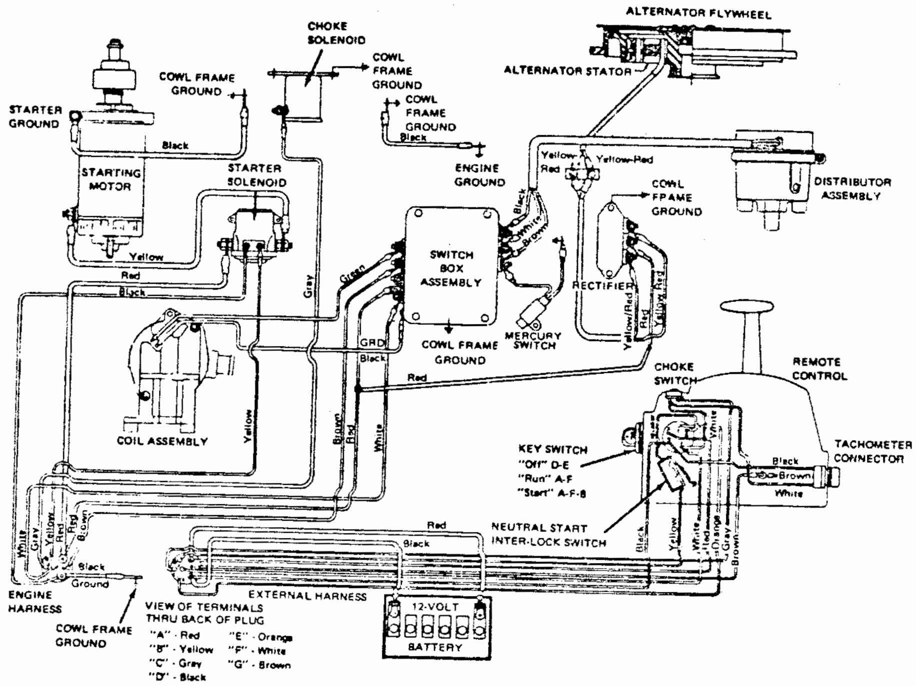


MERC 650 (3-CYL.) (1976) and MERC 700 (3-CYL.) (1977-78)



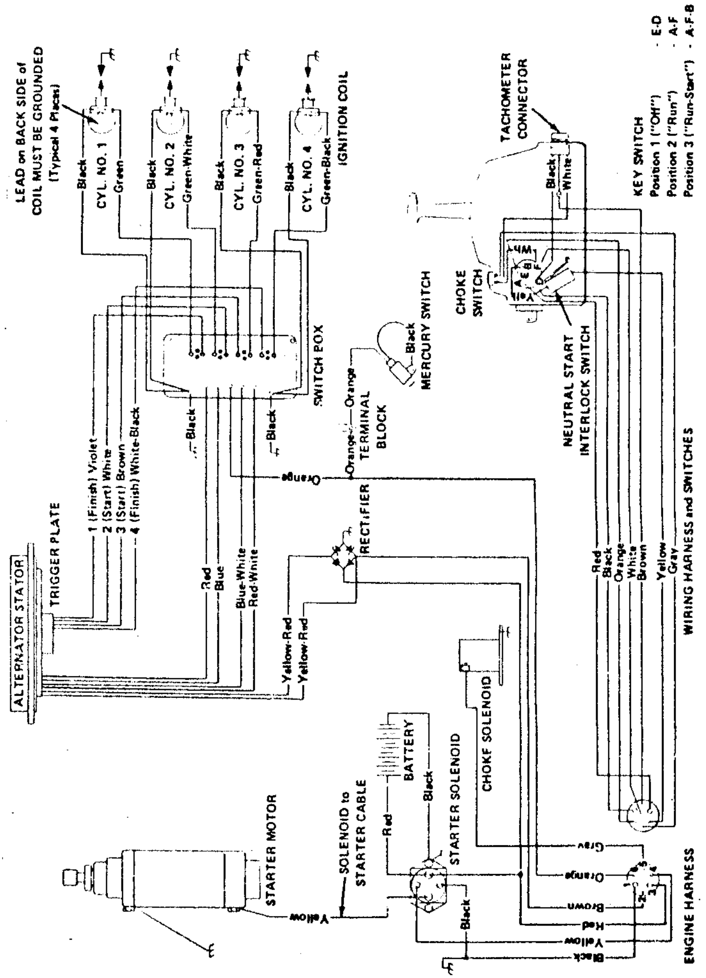


MERC 650 (3-CYL.) (1975)

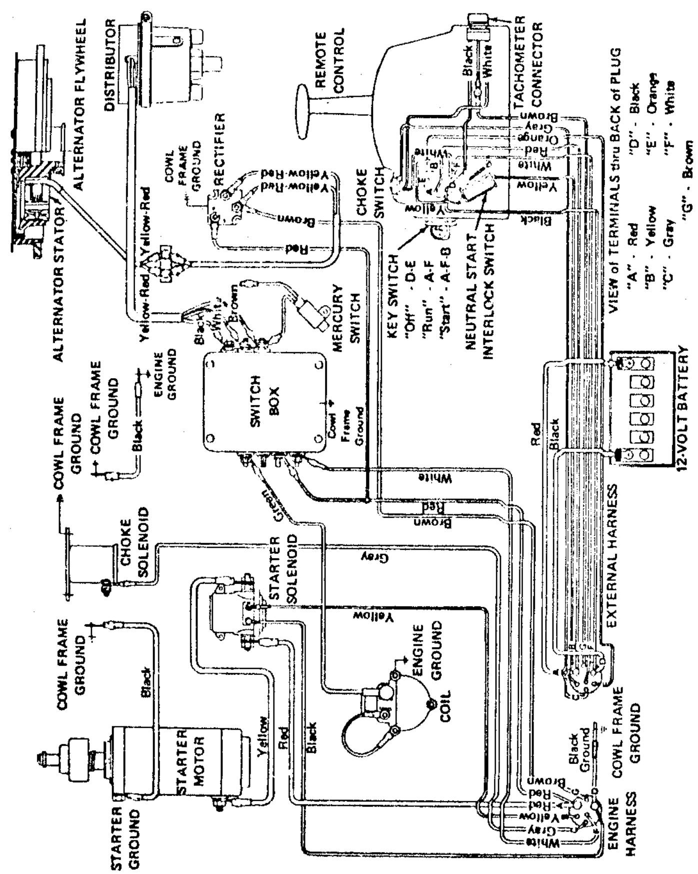


MERC 850-1150-1500 (1975)

MERC 850 (1976-77) and 800 (1978)



MERC 900-1150-1400 and 1500 (1976-77-78) (In-Line)



MERC V-6's (1976-77-78)

